



# Review of the 2010–11 Flood Warnings & Response

Final Report by Neil Comrie AO, APM  
1 December 2011





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# Review of the 2010–11 Flood Warnings and Response

[vicfloodsreview@justice.vic.gov.au](mailto:vicfloodsreview@justice.vic.gov.au)  
[www.floodsreview.vic.gov.au](http://www.floodsreview.vic.gov.au)

The Honourable Ted Baillieu MP  
Premier of Victoria  
1 Treasury Place  
Melbourne VIC 3002

Dear Premier

The Final Report of the Review of the 2010–11 Flood Warnings and Response is forwarded herewith in accordance with the Terms of Reference.

This Review has provided the opportunity to conduct a detailed examination of the emergency management arrangements in Victoria in the context of the 2010–11 floods. It has also provided the opportunity to revisit several of the findings and recommendations of the 2009 Victorian Bushfires Royal Commission. It is noteworthy that the Floods Review and the Royal Commission have both revealed significant shortcomings in Victoria's emergency management arrangements.

The recommendations in this report will support the major reform program announced on 12 September 2011 with the release of the government's green paper *Towards a More Disaster Resilient and Safer Victoria* and the companion document *Victoria Prepared: An Action Plan*. Importantly, I have concluded that there is presently a palpable appetite and momentum for reform in Victoria's emergency management sector.

I wish to record my appreciation of the contribution of many Victorians to the formulation of the recommendations in this report. I also observe that Victoria is well served by the many paid and volunteer emergency service workers who performed admirably in dealing with the considerable challenges presented by the 2010–11 floods in this state.

I commend the recommendations in this report to the Victorian Government.

Yours sincerely

Neil Comrie AO, APM  
1 December 2011

# Executive summary

The ultimate test of the efficacy of emergency management arrangements should always be the extent to which these arrangements deliver an acceptable measure of safety and security to the community. The most meaningful way to evaluate the efficacy of these arrangements is to examine their application in the management of a major emergency.

Victoria has been presented with such an opportunity as a consequence of two of the most serious natural disasters in Victoria's history having occurred in the past two years. The Black Saturday bushfires of 7 February 2009 and the widespread floods of late 2010, early 2011, have severely tested Victoria's emergency management arrangements. The learnings from these tragedies must not be lost. In undertaking this Review, the Victorian Floods Review (VFR) has considered all issues against the primary imperative of community safety and security.

It is noteworthy that both the Victorian Bushfires Royal Commission (VBRC) and the VFR have identified similar serious shortcomings in the state's emergency management arrangements. Given this situation, it would be particularly unfair for the VFR to focus on the performance of individuals or agencies that were required to operate under these flawed arrangements. Consequently, the VFR has taken a strategic approach and examined relevant legislation, policy, structures, systems and processes that drive emergency management in this state.

Victoria is well served by the many committed and professional paid and volunteer personnel who make up our emergency services. These emergency workers deliver a high quality of service on a daily basis in response to low and medium level emergencies. Victoria also has the distinct advantage of a high level of community spirit that was so evident during the visits by the VFR to flood affected areas. These extremely positive attributes provide a strong foundation on which to build major reform.

The 'all hazards, all agencies' philosophy of emergency management remains appropriate for Victoria. However, this philosophy is not being effectively operationalised because of barriers in organisational culture, communication, coordination, interoperability and information collation and sharing. This situation is not sustainable and requires major reform.

The absence of any overarching policy framework or centralised operational control (except for fire hazards) results in a siloed, uncoordinated structure that invariably breaks down in the face of a large scale or protracted emergency. This fact was evidenced on Black Saturday and again during the 2010–11 floods. The lack of robust policy to facilitate coordination and inadequate command and control arrangements resulted in an ad hoc response to the floods. This was despite the best endeavours of the many paid and volunteer emergency workers who responded admirably to the many challenges they faced.

In the view of the VFR, these shortcomings can only be overcome by the establishment of a central body that has the authority, capacity and capability to drive a program of major reform. This reform should be based on an overarching policy framework that requires all levels of government and emergency services agencies to work effectively to achieve an 'all hazards, all agencies' approach to their responsibilities. The VFR is also of the view that the operational response to all emergencies should be under the direct control of an accountable officer (similar to the role of the Fire Services Commissioner). The authority for control should be scalable to ensure that all emergencies are managed in an effective manner.

On the evidence available to the VFR, one of the major problems that should be addressed is the lack of a logical, hierarchical approach to all phases of emergency management. This problem is best illustrated in the planning phase, where there are two major gaps in the system. Apart from those towns in fire prone areas that have, or are developing (fire oriented) Township Protection Plans (TPPs), most other towns in Victoria are only covered by more generic Municipal Emergency Management Plans (MEMPs). For the most part, where up to date regional emergency management plans exist, they do not correlate with the hazard or risk footprint, but follow artificial administrative boundaries. Consequently, known hazards are currently not adequately addressed across a number of locations.

Again, on the clear evidence available to the VFR, several municipalities do not have the resources to adequately manage major emergencies within their boundaries. In the absence of effective regional arrangements to support these municipalities, a range of ad hoc arrangements were put in place during and after the floods to provide this vital support. The VFR is of the view that a more structured mutual support system is required that will create a "clustering" arrangement for municipalities supported by the state's existing regional structure.

Accurate and timely emergency warnings to communities are critical in the saving of lives and mitigation of property damage. Improvements are required to Victoria's Total Flood Warning System (TFWS) which needs to be better tailored to meet local requirements. This requires involvement and contribution from those it is intended to serve.

The lack of clarity over roles and ownership is an impediment to achieving a best practice flood warning system. At best, these roles are shared or fragmented which does not provide accountability. This situation includes the Bureau of Meteorology (BoM) and consequently the level of service it provides to Victorian communities needs revisiting.

There are gaps in the gauging network, however, more flood gauges will be of limited benefit without communities knowing what warnings mean for them so that they can take the necessary steps to ensure their safety and reduce property damage. Enhanced flood risk planning, including coverage and quality of mapping, coupled with community education is required.



The Emergency Alert (EA) telephone warning system was used extensively in Victoria for the first time during the floods. While this intrusive warning system was generally effective, its use and operation in some instances by emergency services reduced its overall effectiveness. Clear directions are required on standardising the messaging and application of the system, including the circumstances in which it is used.

This Review has also revealed serious concerns about the protection of essential service infrastructure that is owned and operated by private industry. The electricity sub-station at Charlton and the Kerang terminal station are constructed on floodplains. Neither is adequately protected from major flooding. This resulted in the extended outage of power at Charlton that, among other things, severely restricted emergency communications. The Kerang terminal station was protected following a concerted effort, including by the local community, to build a sandbag levee as the flood approached.

The financial impact of these floods was substantial for householders, farmers, business owners and government. Many millions of dollars have been required to rectify the major damage that occurred throughout Victoria. It is evident to the VFR that some of this damage could have been avoided through effective planning and mitigation. In particular, the state should improve the land use planning mechanisms (including quicker integration of flood mapping) that prevent the building of homes and businesses on land that is prone to flooding. As a consequence of the 2010–11 floods, Victoria has a clear picture of those areas where flooding is an issue that should be considered in planning decisions.

Although the general feedback from the community and local government was quite positive about the quantum of government grants to address damage caused by the floods, concerns were regularly expressed about the means of accessing these grants. These concerns related to confusing and conflicting advice given by different government agencies and this problem would be best addressed by a common web portal (or “one stop shop”) for grant information. It is understood that measures are currently being taken to address this issue.

The Victorian Bushfires Royal Commission (VBRC) addressed the evacuation of vulnerable people during emergencies and the VFR and the Bushfires Royal Commission Implementation Monitor (BRCIM) have engaged with the Departments of Health (DH) and Human Services (DHS) to guide the current bushfire focused work to encompass an ‘all hazards’ approach.

One consistent theme which emerged during the community consultations was a strong desire for community involvement in all phases of emergency management: planning, preparation, response and recovery. Concern was often expressed that communities had not been actively engaged in this process and invaluable local knowledge was not adequately considered. There was a prevailing sense that local communities had been disempowered by the state within the emergency management framework.

The VBRC addressed the issue of shared responsibility and stated ‘responsibility for community safety ... is shared by the state, municipal councils, individuals, household members and the broader community’. The VFR shares this view but notes that a great deal of work needs to be done to equip communities and individuals to meet these obligations. During the 2010–11 floods, several small communities were completely isolated and unable to rely on emergency services to undertake critical safety and response activity. Some of these communities suffered because of the absence of basic knowledge and skills in emergency management, such as how to fill and stack sandbags to protect property.

With regard to the significant reforms required to address the emergency management arrangements in Victoria, the VFR is of the firm view that the most effective means of making our communities safer is to build their resilience to natural disasters. The February 2011 National Strategy for Disaster Resilience (NSDR) published by the Council of Australian Governments (COAG) is an important reference document in this regard and the VFR offers strong support for the objectives of the strategy.

The VFR expresses its admiration for the selfless commitment of volunteers in supporting community safety and security. Their role in responding to the many challenges presented by the 2010–11 floods was remarkable and worthy of commendation. Victoria’s approach to emergency management in disasters on a scale such as Black Saturday or the 2010–11 floods is highly dependent on volunteers. As such, we must ensure that volunteers are appropriately supported and equipped to undertake this important role.

Having undertaken the role of the BRCIM as well as Chair of the Floods Review, I have been in the unique position of being able to examine the state’s management of these disasters from different perspectives. Consequently, I am confident that the recommendations in this report, if implemented, will significantly improve the capacity of the state to deal with such disasters in the future. Given the ever present risk of natural disasters, it is in the interests of the Victorian community that the critical major reforms detailed in this report are addressed as soon as possible.

# Summary of recommendations

## Chapter One – The adequacy of flood predictions and modelling

The VFR recommends that:

1. the state take the necessary measures to clarify roles, responsibilities and cost-sharing arrangements for flood warning systems, including tasking state and regional bodies to be responsible for the flood warning system. This will require engaging with the commonwealth to amend the 2001 arrangements, updating the 1998 floodplain management strategy accordingly and continuing to support commonwealth initiatives designed to improve flood mapping standards and associated issues.
2. the state task the Emergency Services Commissioner with the responsibility to establish an effective audit regime of the total flood warning system.
3. the state develop a flood warning system for each basin and location with community input and make relevant documents publicly available. Each warning system should include key performance indicators.
4. the state and commonwealth undertake a review into the appropriate institutional arrangements for the forecasting and predictions function currently undertaken by Melbourne Water for the Port Phillip and Westernport region.
5. the state engage with the Bureau of Meteorology to establish a joint initiative to review existing flash flood warning systems in Victoria and identify where additional systems are needed, with a particular focus on urban centres with a history of flash flooding. This review should seek to achieve outcomes similar to those implemented in NSW. Subject to those outcomes being implemented, the state should determine which agency is responsible for flash flood warnings.
6. the state and the Bureau of Meteorology liaise to ensure the existence of appropriate quality control processes for gauges and contingency measures in the event that gauges are damaged during flood events.
7. the state expand the Regional Water Monitoring Partnerships model to include all flood warning gauges.
8. the state:
  - undertake a strategic review to identify areas at risk from flash or riverine flooding. Shortcomings in the flood gauging networks identified in the review should then be the focus of remedial action
  - seek to address as a priority any notable gaps in the total flood warning system as apparent in the 2010–11 floods (including south west Victoria, Wimmera and north central region) by enhancing mapping, gauging and education programs; and
  - seek a commitment from the Bureau of Meteorology to ensure any new gauges installed are utilised to enhance flood prediction capability and coverage.
9. the state, in consultation with Bureau of Meteorology and Melbourne Water, take the necessary action to ensure that all flood warnings issued are linked to the geographical location of the gauge the data was derived from.
10. the Bureau of Meteorology should present water levels in both local datum and Australian Height Datum (gauge zero) for all its published information and warnings.
11. the state take the necessary measures to upgrade existing manual stream and rain gauges and ensure that all future gauges provide a seamless transfer of data from the gauges to the Bureau of Meteorology.
12. the Bureau of Meteorology undertake a review of its radar coverage in the context of flash and riverine flood warnings for Victoria, with a particular focus on known gap areas such as the Horsham/Nhill region.
13. the Bureau of Meteorology adjust its flood prediction models to incorporate water storage conditions (to enable it to issue more timely and useful flood predictions for communities based downstream of water storages).
14. the state clarify the role of intelligence cell staff (for example, hydrologists and/or Catchment Management Authority) who are utilised in Incident Control Centres during flood events.
15. the state ensure that all personnel who, because of their particular flood expertise, are likely to be potential participants in an Incident Control Centre are familiar with the requirements of the Australasian Inter-service Incident Management System structure.
16. the state ensure that all personnel who are likely to become involved in incident management teams for floods receive basic flood awareness training prior to such involvement.
17. the state establish appropriate arrangements to ensure the capacity to maintain technical expertise for flood intelligence is initiated, including appropriate agreements with commercial experts.
18. the state ensure that regional and local flood plans incorporate all available flood mapping and intelligence, including assessments of levees and flood consequence information.
19. the state develop an efficient process to ensure that, during flood events, temporary construction of flood mitigation works, such as levees, is controlled so as not to unacceptably impact on flood intelligence.
20. the Bureau of Meteorology provide Incident Control Centres with real-time access to flood data held by the Bureau of Meteorology. This will require Bureau of Meteorology staff making themselves available to respond to enquiries from Incident Control Centres during a flood event.

21. the state establish standards for flood mapping to ensure they are kept contemporary and meet the purposes of landuse risk planning and emergency response. In doing so, maps should extend where appropriate to include Probable Maximum Flood, over a range of Annual Exceedence Probability levels and be explicitly linked to a stream gauge.
22. the state take the necessary measures to require that local knowledge is considered in flood risk planning, including verification of flood maps and flood response plans.
23. the state establish a process for volunteer community member accreditation to allow volunteers to provide flood information to the control agency during a flood event. This process should establish a base competency standard and provide appropriate emergency management and Australasian Inter-service Incident Management System training to accredited community volunteers.
24. the Bureau of Meteorology expand its volunteer amateur weather watch groups to enhance its weather and flood information gathering procedures.
25. the state require dam owners and operators to review storage operating manuals to incorporate lessons from the 2010–11 floods and make this information publicly available. The manuals should include a clear policy on dam surcharging and pre-release.
26. the state require that dam owners and operators inform the control agency and the Bureau of Meteorology about the management and operation of dams and weirs consistent with the flood warning requirements of the relevant river systems, including providing telemetry at sites as necessary. This may require the state proactively liaising with other states to ensure equivalent obligations are placed on interstate dam operators where the dam may impact Victorian communities.
27. the state require that dam owners and operators inform people situated downstream of water storages if the owners/operators become aware of an immediate threat arising from the dam to the safety of those people. The owner/operators should provide this information as soon as the owner/operators become aware of the threat.
28. the state require dam owners and operators provide regular situational reports to the relevant control agency where dam issues may impact incident management.
29. the state clarify which agency is responsible for collecting post-flood extent and related data. This should include:
  - the development of guidelines to ensure consistent standards are applied to post-flood data collection; and
  - an appropriate process to ensure funding availability for such activities.
30. the state take into account any outcomes from the Commonwealth Government's flood mapping reviews in the continual development of the Victorian flood database and to incorporate into the database flood data currently held by Melbourne Water.

## Chapter Two – The timeliness and effectiveness of warnings and public information

The VFR recommends that:

31. the state undertake a community education program to inform households of their respective flood risk. This may include information on rate notices of heights of houses above flood level and educating people about flash flooding.
32. the state allocate core funding for the ongoing delivery of the 'FloodSafe' program to flood prone communities across Victoria.
33. the state develop and implement a single web portal as a means of providing emergency information to communities and local government on an 'all hazards' basis, including the information referred to in recommendations 74, 89 and 92.
34. the state develop and implement standards for Emergency Alert to ensure consistent use, training and application by accredited operators within agencies across 'all hazards'.
35. the state require that agencies operate in compliance with the guidelines of the Victorian Warning Protocol to ensure efficacy of warning messages.
36. the state put in place appropriate measures to inform the community of the intended purpose of the Emergency Alert warning system.
37. the state develop a standard approach to the provision of emergency warnings and information in formats – spoken and written – that recognise diverse community needs, including language and disability.
38. the state engage with local government to ensure emergency services' public information and warnings reflect the community demographic.
39. the state investigate the ability to refine the Flood and Storm Information Line to enable it to receive as well as provide information.
40. the state review its Memoranda of Understanding with official emergency broadcasters to take account of increased usage of internet based information, including social media and the ability to broadcast community meetings.
41. the state actively pursue the use of social media as part of its emergency warning and public information system.
42. the state undertake further trials to explore the opportunity for greater use of social media as a credible source of information to and from the public during an emergency.

## Chapter Three – emergency services command and control arrangements

The VFR recommends that:

43. the state appoint a state emergency controller who is ultimately accountable for all major emergencies.
44. the state reconfigure the Victorian Emergency Management Council and the supportive committee arrangements to ensure a comprehensive, accountable, effective and integrated approach to the development of emergency management arrangements is in place for Victoria. The process should also include consideration of the Security and Emergencies Committee and Central Government Response Committee roles, functions, reporting arrangements and relationships with other state level emergency management groups. Settled arrangements must be clearly articulated to ensure stakeholder understanding.
45. the state, as a matter of urgency, develop a multi-agency Incident Control Team capability to be readily available for statewide deployment to establish incident control or to relieve functioning control structures.
46. the state develop and implement operational performance standards for each state agency involved in emergency management response and recovery and that:
  - each agency be assessed by the Emergency Services Commissioner periodically against these performance standards for both capability and capacity; and
  - where performance against these standards for either capability or capacity cannot be demonstrated by any agency
    - appropriate advice is communicated to the relevant Minister, departmental/agency head and State Emergency Response Coordinator; and
    - an action plan is developed and implemented to address the relevant capability or capacity deficiency in both the short and longer term.
47. the state commit to securing effective multi-agency interoperable communications as a high level priority and that all future communications projects and upgrades incorporate compliance provisions mandating interoperability requirements.
48. the state ensure that common and interoperable resource management systems are developed and implemented by emergency management agencies. Common systems should be utilised to the fullest extent possible.
49. the state ensure that sector wide familiarity and understanding of the various systems for incident management is developed and maintained. Primarily, this should be achieved through multi-agency emergency management training and exercising involving usage of the various agency incident management systems.
50. the state ensure that interoperable information management practices are developed and implemented by emergency management agencies. Common systems should be utilised to the fullest extent possible.
51. the state ensure that appropriate record management processes are developed and implemented and that these processes also provide record accountability for multi-agency operations. Agency processes should be standardised to the fullest extent possible.
52. the state ensure, as a matter of priority, that the State Control Centre is able to function as a fit for purpose, multi-agency emergency management centre. Necessary works to achieve this outcome should have an overarching focus on the implementation of common agency systems and processes to the fullest extent possible.
53. the state ensure that any new systems and equipment purchased by state emergency management agencies are interoperable with other relevant agencies to the fullest extent possible. This should involve the state establishing a procurement gateway process with input from the Emergency Services Commissioner.
54. Victoria Police revise coordinator arrangements to ensure:
  - a coordinator presence is maintained at the place where incident control is being exercised
  - effective control is established and is maintained until the response phase has concluded
  - key control roles may be performed by personnel from agencies other than the designated control agency
  - that the timely compilation and distribution of an appropriate Incident Action Plan is recognised as a fundamental component of establishing effective control
  - those performing the coordinator role at an Incident Control Centre be suitably trained, skilled and experienced in emergency management and where possible possess a degree of local knowledge of the relevant area; and
  - that the revised coordinator arrangements are reflected within the State Emergency Response Plan.
55. the State Emergency Response Coordinator further develop the Strategic Emergency Management Assurance Team process by involving subject matter experts from relevant emergency management control agencies who are the subject of Strategic Emergency Management Assurance Team focus.



56. the state conduct an 'all hazards' needs analysis to determine requirements for level 3 Incident Control Centres with a focus on 'all hazards' and multi-agency capability. Following this analysis, the state take steps to ensure the availability of sufficient and functional level 3 Incident Control Centres across the state with an 'all hazards' and multi-agency capability.
57. the state:
  - ensure an 'all hazards, all agencies' approach to Incident Action Plan compilation is developed and implemented to enable the timely issue of functional Incident Action Plans. All agency incident action planning processes should be standardised to the fullest extent possible, including consideration of a library of pro-forma Incident Action Plans; and
  - develop and implement mechanisms to test and ensure that agencies possess satisfactory incident action planning capability and capacity for 'all hazards' at all levels of operations.
58. the state:
  - revise the Emergency Management Team Practice Note to include a template to ensure an appropriate and consistent approach to Emergency Management Team operations
  - provide the revised Emergency Management Team Practice Note to all stakeholders to enable familiarisation; and
  - ensure that there is regular exercising of Emergency Management Teams with an 'all hazards' focus.
59. the state ensure:
  - a common, functional and accessible system be introduced to enable effective Municipal Emergency Coordination Centre and Incident Control Centre communications
  - a regime of regular Municipal Emergency Coordination Centre exercising is introduced with oversight by an appropriate independent body. Such exercising should include testing of systems utilised for Incident Control Centre and Municipal Emergency Coordination Centre communications
  - those required to perform Emergency Management Liaison Officer roles have undertaken appropriate training; and
  - resource requesting arrangements are clarified and documented so that control and coordination functions do not overlap.
60. the state undertake a complete review of emergency management legislation. This should include agency-specific emergency management legislation and should focus on service interoperability and securing an 'all hazards, all agencies' capability.
61. the state formalise and continue the Emergency Response Legal Advisers Forum.
62. the state ensure:
  - water rescue/swift water rescue definitions, roles and responsibilities are clarified and communicated to all stakeholders to ensure common understanding
  - appropriate training, equipment and support is provided to those required to perform water rescue/swift water rescue. Common training programs, standards and accreditation should be utilised wherever possible to increase potential for joined up operations and maximised capability
  - that based upon the experiences of these flood events, an appropriate level of water rescue capacity and capability is established and maintained
  - flood plans (all levels) and flood emergency response planning incorporate consideration of pre-positioning of appropriate water rescue capability in the event that such services should be required; and
  - that revised water rescue roles, responsibilities and arrangements are clearly defined in the *Emergency Management Manual Victoria* and such definitions are replicated in all individual agency planning and operational documents.
63. the state introduce a joint emergency management leadership training program that will deliver critical core competencies for all levels of management of major emergencies. Future appointments to senior operational emergency management positions should require successful accreditation at the appropriate level.
64. the state:
  - ensure an appropriate regime of regular emergency management training and exercising is introduced. This must be 'all hazards' and multi-agency focused and include all relevant stakeholders
  - designate an accountable officer to hold ongoing responsibility for conducting such exercises; and
  - designate the Emergency Services Commissioner as holding ongoing responsibility for auditing and reviewing this training and exercising.
65. the state develop and implement a strategy that maximises the flexibility and united capacity of the Country Fire Authority and Victoria State Emergency Service to respond to emergencies.

66. the state undertake major reform of Victoria's emergency management arrangements to bring about an effective 'all hazards, all agencies' approach, incorporating:
- clarity of command and control in all emergencies
  - common operating platforms, including communications and information technology
  - interoperability between all agencies
  - regular joint training and exercising by all agencies
  - the development and implementation of performance standards for each emergency management agency
  - the development and maintenance of effective planning arrangements at all levels of emergency management
  - a meaningful monitoring and audit regime for designated standards and planning requirements; and
  - an effective accountability mechanism to support the maintenance of legislative and other agency obligations.

## Chapter Four – the adequacy of evacuations of people most at-risk, including those in health and aged care facilities

The VFR recommends that:

67. the Departments of Health and Human Services finalise the definition of 'vulnerable person' and the list of facility types where vulnerable people are located and ensure that the definition and associated policy(ies) are applicable across 'all hazards'.
68. the state review and align all policies and procedures for evacuation, such as the interim evacuation guidelines and the State Health Emergency Response Plan, to ensure consistency and to clarify roles and responsibilities.
69. municipal councils undertake a risk assessment of caravan parks and decide if any should be included in the list of facilities where vulnerable people may be located.
70. the state update the current fire specific guidelines and resources for evacuation planning to take an 'all hazards' approach.
71. the commonwealth consider including (as part of its review of standards for aged care services) requirements for:
- robust 'all hazards' evacuation plans that include current after-hour contact details of people who are able to make authoritative decisions during an emergency; and
  - rehearsal of those plans.
72. the state and the commonwealth, during a flood event, make information available on providers who have capacity to accommodate patients and residents who require evacuation.

## Chapter Five – the adequacy of clean-up and recovery arrangements

The VFR recommends that:

73. the state review the legislation and policies that set out clean-up and recovery responsibilities for infrastructure such as crossovers, culverts, drains, bridges and waterways, including consideration of:
- whether the entities who are given obligations or powers to undertake clean-up works have the capacity to do so; and
  - the appropriateness of having different legal regimes for what is essentially the same piece of infrastructure.
- If the review reveals that the current responsibility matrix is inadequate, the state develop an action plan to address the identified shortcomings.
74. the state make available to the public a clear guide of who is responsible for:
- clean-up and recovery of various types of infrastructure that straddle the public/private boundary; and
  - the policies agencies will follow in determining whether to repair infrastructure under their control.
75. the state, in respect of the Rapid Impact Assessment process:
- resolve which agency/ies has policy and operational responsibility for this process
  - define the purpose of Rapid Impact Assessment; and
  - review the process, in light of the 2010–11 floods, to examine options to improve the efficiency of the collection of information.
76. the Department of Planning and Community Development review the volunteer register and examine additional options to support councils in volunteer management, including the development of tools and staffing support.
77. the Department of Planning and Community Development examine strategies to address and clarify insurance coverage of community volunteers in emergency events.
78. the state review the potential for National Registration and Inquiry System 6 to provide a single point of information collection to both register individuals and plan the delivery of recovery services. If the review determines National Registration and Inquiry System 6 is unable to fulfil this function, the state should work with the commonwealth and other states to implement the necessary changes to National Registration and Inquiry System 6. If National Registration and Inquiry System 6 is unable to be developed as a single information collection system:

- the state should develop and implement a single point of information collection system, including how information obtained from outreach activities can be incorporated into this system and how such information may be linked into the Rapid Impact Assessment process.
79. the state amend the current protocol governing National Registration and Inquiry System information collection and sharing to:
- clarify the role of councils and Centrelink during and after emergencies
  - ensure the amended protocol is written in plain English and easily understood; and
  - coordinate, in conjunction with the state and federal privacy commissioners, the development of a new National Registration and Inquiry System information sharing protocol in line with the proposed National Registration and Inquiry System 6 and state or federal privacy legislation.
80. the state review the way early outreach occurs and implement changes that will ensure that there is a consistency of approach regardless of which agency undertakes the service.
81. the state clarify the transition to recovery arrangements including the processes for approving and funding of essential works after transition to recovery has been formalised.

## Chapter Six – the adequacy of service delivery by federal, state and local governments

The VFR recommends that:

82. the state (consistent with recommendation 46) develop a model for determining the capability and capacity of departments and agencies with roles and responsibilities in large scale or protracted emergencies. The issues of capability and capacity should be addressed at all levels of emergency management planning.
83. the state task the Emergency Services Commissioner with the responsibility to develop and undertake the regular audit of emergency management plans at all levels.
84. the state ensure:
- where external assistance is provided to Victoria during emergencies, communities are advised of the specific purpose of that assistance, through media and other information channels; and
  - all agencies provide incident management personnel with information regarding the arrangements for tasking Australian Defence Force resources and that this advice is reinforced during emergencies where Australian Defence Force support is provided.

85. the state:
- assess current risk and risk mitigation strategies for essential services, with a focus on ensuring that risks are appropriately identified at all levels of emergency planning; and
  - ensure that the responsible authority or owner/operator of essential services put in place appropriate strategies to mitigate any risk to service continuity.
86. the state:
- adopt a strategy to expedite incorporation of updated flood mapping or modelling into planning schemes
  - reconsider in what circumstances the '1 in 100 year event' is the appropriate design event
  - actively support the Australian Building Code Board in its development of a new national standard for residential buildings in flood prone areas. Until such time as any new standard is incorporated into Victorian law, provide advice to householders about appropriate building materials for flood prone areas and ways that houses can be designed or adapted to mitigate flood risk; and
  - retain the ability of a Catchment Management Authority to require a council to refuse a planning permit or impose particular conditions when the Catchment Management Authority considers the flooding risk to be unacceptable.
87. the state, following the completion of the Municipal Association of Victoria Improving Emergency Management in Local Government program, work with municipalities to revise the role and responsibilities of local government in emergency management. The issue of capability and capacity of each local government should be addressed in all related emergency management arrangements.
88. the state develop and incorporate into emergency management planning regimes plans based on geographic risk, such as sub-regional plans.

## Chapter Seven – the adequacy of funding provided by state and federal governments for emergency grants

The VFR recommends that:

89. the Department of Human Services develop proactive strategies to provide information and assistance for people applying for emergency grants.
90. the state implement arrangements to improve the support provided to local government on disaster financing before, during and after emergency events.



91. the state finalise the 2008 review of Victoria's municipal assistance. This should include addressing:
  - the provision of upfront funding for local councils for repair of community assets
  - packages for early relief and recovery to be included in both the Natural Disaster Funding Arrangements and the Natural Disaster Relief and Recovery Arrangements, including outreach packages; and
  - the process of reimbursement of local councils after floods.
92. the state:
  - ensure that the concerns raised by Victorians regarding the Natural Disaster Relief and Recovery Arrangements are provided to the national review, including the issues of:
    - betterment (what it means and how it is applied); and
    - the 51 per cent income rule for eligibility of businesses for grants.
  - establish a single point of information (such as the single web portal referred to in recommendation 33) on all emergency related financial assistance available to individuals, businesses and local government. The means of accessing this information should be widely circulated in the community.

## Chapter Eight – Community resilience

The VFR recommends that:

93. the state comprehensively pursue the objective of achieving (where possible) the priority outcomes of the *National Strategy for Disaster Resilience* and the imperative of shared responsibility, in particular by:
  - requiring that local knowledge is considered as a critical component of all phases of emergency management
  - involving local communities in the development and ownership of community resilience plans based on an 'all hazards' approach and tailored for the specific needs of each community
  - encouraging local communities to form resilience committees to develop and administer community resilience plans
  - nominating Victoria Police as the lead agency in initiating the strategy to develop community resilience committees; and
  - requiring emergency service agencies to consult and engage with local community resilience committees in the preparation, planning, response and recovery phases of emergency management.

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# Review of the 2010–11 flood warnings and response

## Announcement by government

On Tuesday 8 February 2011, the Premier, the Honourable Ted Baillieu MP, announced a comprehensive review of flood warnings and emergency response efforts to be undertaken in the wake of severe flooding across Victoria.

The Premier said that this review would be led by Mr Neil Comrie AO, APM, former Chief Commissioner of Victoria Police (VicPol) and current BRCIM. Mr Baillieu stated that in this latter role, Mr Comrie had gained significant expertise in, and understanding of, Victoria's emergency management arrangements and that there are a number of similarities between the two roles, particularly in terms of the agencies and systems involved.

## Terms of reference

The Premier announced the following Terms of Reference for this review:

*The Review of the 2010–11 Flood Warnings and Response will examine:*

- *the adequacy of flood predictions, including technology and modelling techniques used*
- *the adequacy, timeliness and effectiveness of flood warnings and public information*
- *emergency services command and control arrangements utilised to manage the emergency*
- *the adequacy of evacuations of people at greatest risk including health and aged care facilities*
- *the adequacy of clean-up and recovery arrangements*
- *the adequacy of service delivery by state and federal government agencies, local governments and volunteer-based organisations*
- *the adequacy of the funding provided by the state and federal governments in the form of emergency grants in their various categories.*

*This review will seek advice from experts in the field of flood management and will involve extensive community consultation, especially with regard to emergency warnings and evacuations.*

*Mr Comrie is required to make such recommendations arising from his review, as he considers appropriate, including recommendations for governments, emergency services, other entities and the community.*

An Interim Report was provided to the Premier for the information of Cabinet by 30 June 2011 and subsequently released on 11 July 2011. As required, this Final Report is presented to the Premier by 1 December 2011.

# Introduction

This introduction was provided in the VFR Interim Report on 30 June 2011. It is repeated with some additional information in this Final Report as it provides important contextual material for the many issues discussed in the following chapters.

## History of floods in Victoria<sup>1</sup>

Major regional flooding occurs somewhere in Victoria every 10 to 20 years. In the last century major regional floods occurred in 1909, 1916, 1917, 1934, 1956, 1974, 1990, 1993 and 1998. There are 39 drainage basins across Victoria, each comprising a number of rivers and streams. These rivers and streams are subject to flooding and travel through and around many towns and communities. These periodical floods sometimes result in significant social and economic consequences for local communities and the state. Many of Victoria's important agricultural areas are also located on the floodplains of most major river systems to take advantage of fertile soils.

Riverine flooding<sup>2</sup> has generally occurred in widespread areas of central Victoria, north eastern Victoria and Gippsland and there is a history of previous flooding along the Murray River and its tributaries. Major flooding has also occurred along the Yarra, Barwon and Maribyrnong Rivers, all of which has caused damage and major disruption. However, while less frequent, there is also a history of major flooding in both north west and south west Victoria catchments. Catchments in the northern plains area of north west Victoria are particularly prone to significant flooding from relatively small rainfall totals once the soil has become saturated. Flash flooding<sup>3</sup> has also occurred in regional urban areas like Geelong, Ballarat and Bendigo and also in metropolitan Melbourne.

The long term average of flood damage in Victoria is estimated at \$350 million per annum.<sup>4</sup> This includes both direct physical damage to properties and assets and indirect damage arising from disruption of normal social and economic activities. However, there are many effects which cannot be evaluated in monetary terms, hence, this figure does not include the intangible impacts of flooding, such as loss of life, perceived loss of security of the home, fear of continuing severe flood events, loss of memorabilia and physical and psychological effects on human health and well being. Five years on, since this estimation was made, the average damage costs are likely to be considerably higher.

## Managing floods in Victoria

The 1998 Victorian Flood Management Strategy (VFMS) provides the strategic policy framework for flood management in Victoria. The strategy also contains a program of actions to collate the available data on floodplains and implement measures to reduce the flood risk to communities. It also importantly outlines the roles and responsibilities for governments, organisations and communities involved in flood management, including flood studies, mapping, mitigation works and flood warning. The VFMS is currently under revision.

It is important to understand that the application of appropriate land use planning controls as part of municipal planning schemes is considered an effective means of minimising flood damage. Municipal councils are required to take into account flood risk to ensure appropriate development on floodplains.

The management of water in storages is governed by statutory arrangements under the *Water Act 1989*. These place conditions on the use, management and supply of water. Storage managers may operate storages for flood mitigation purposes, however, not at the expense of protecting the reliability and quality of supply water.

Victoria's approach to the management of emergencies, which was developed and agreed to by emergency services and emergency management agencies, is based on the philosophy of 'all hazards' and 'all agencies'. Emergency management in Victoria requires the active participation of the whole of government and whole of the community. The emergency arrangements are regulated through the *Emergency Management Act 1986* (the EM Act), which is intended to ensure an organised structure exists to facilitate planning, preparedness, operational control and coordination as well as community participation in the prevention, response and recovery from an emergency incident.

Many key agencies involved in emergency management also operate under their own independent Acts, some dating back to the late 1950s. Specific control and coordination arrangements during an emergency, including flood, are outlined in the Emergency Management Manual Victoria (EMMV). This manual contains procedures for dealing with emergencies of all sizes and includes arrangements that cater for those events requiring multi-agency action, including those requiring participation from both state and commonwealth agencies.

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1 State Flood Response Plan V1.4, 2007, Victoria State Emergency Service, p 5

2 Heavy or sustained rainfall resulting in a river or creek exceeding channel capacity resulting in inundation of the adjacent floodplain.

3 Heavy and often localised rainfall, resulting in both artificial and natural drainage systems exceeding capacity, resulting in water flowing along roads and/or land occupied by houses and other buildings

4 State Flood Response Plan V1.4 2007, Victoria State Emergency Service, p 4



Major emergencies occur infrequently and initially may be difficult to differentiate from lesser order events. Victoria's emergency management arrangements are intended to enable scalability. The arrangements are intended to apply to both small and large scale events.

In order to protect life, property and the environment it is necessary to have:

- an understanding of hazards that the community faces
- a program for prevention and mitigation of emergency events and their consequences
- an informed, alert and prepared community
- timely and accurate community alerts/broadcasts
- identification of those responsible for controlling and coordinating the use of emergency management resources
- acceptance of support roles and responsibilities
- cooperation between emergency services and others and acceptance of their roles in emergency management
- a coordinated approach to the use of all resources
- arrangements to support and enable communities as they recover from emergencies.<sup>5</sup>

The EMMV identifies the Victoria State Emergency Service (VICSES) as the agency nominated to control response activities to a flood in Victoria. In 2007, the VICSES published the State Flood Response Plan (SFRP) that provides strategic guidance for effective emergency response to flood events in Victoria. The plan also describes the roles and responsibilities of agencies and organisations in flood management and key activities in responding to flood including minimising the threat and impact to people, property and the environment. A revised draft of the SFRP is currently under development.

Consistent with any emergency event in the state, VicPol retains the responsibility for emergency services coordination during a flood, which includes ensuring that effective control has been established by the control agency and the effective coordination of resources and services. The EMMV also details the responsibilities of several other agencies involved in flood management such as the BoM, municipalities, catchment management authorities (CMAs), the Country Fire Authority (CFA), DH, DHS and Department of Sustainability and Environment (DSE).

Control of the response to a flood broadly involves gaining control over the area impacted by the event and the resources being utilised for the event, understanding the nature and likely consequences of the event and dealing with those consequences.

The future challenge is to not only ensure that Victoria's emergency service organisations are equipped and trained to respond to emergencies but also to minimise the risk to life and property as far as possible.

The primary aim of flood hazard management is to reduce community vulnerability. In this regard, it is essential that Victorians learn from the recent floods. Therefore, the recommendations in this Final Report of this Review reflect the learnings from the 2010–11 flood events.

## The weather influence on the 2010–11 floods<sup>6</sup>

From September 2010 to February 2011, Victoria experienced some of the worst floods in the state's history. This was on the back of a 14 year drought. Victorians had been focused on securing water for towns, industry and agriculture. Over 400 towns were on water restrictions and nearly 100 towns across northern Victoria on stage three or four water restrictions. The drought also had significant impacts on the availability of water for irrigation.

The floods were fuelled by one of the strongest La Niña events ever recorded. Ocean temperatures around Australia were near record high levels, and there were more frequent low pressure systems over Australia and more humid conditions than usual. La Niña periods are usually associated with above normal rainfall during the second half of the year across large parts of Australia and this was certainly the Victorian experience.

Heavy rain coming from the west began to fall on Friday 3 September 2010, moving eastwards across the state over the weekend. Victoria was drenched, particularly at higher altitudes in the state's west and north east. Significant riverine flooding occurred over the following days as floodwaters made their way into the river systems. Major flood warnings were issued for many river systems including the Avoca, King, Ovens, Goulburn and Wimmera rivers. While the flooding was widespread and swelled many major rivers, flash flooding also occurred in several large regional towns, including Ballarat, Benalla and Bendigo. At least 200 residents were evacuated from the most severely impacted areas across the state, including, Charlton, Creswick, Clunes, Skipton and Wangaratta.

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<sup>5</sup> State Flood Response Plan V1.4 2007, Victoria State Emergency Service, p 4

<sup>6</sup> Source: Bureau of Meteorology Monthly Weather Reviews and Special Climate Statements

From Tuesday 12 October until the weekend, flooding developed in the northern catchments, particularly along the Murray River upstream of Lake Hume. The highest rainfalls were in the north east of the state, with many places recording in excess of 120mm for the four days. At the end of the month, heavy falls were recorded in central and north eastern Victoria, with major flooding occurring of the Campaspe and Loddon rivers.

In November, heavy rain continued, particularly in the north east of the state, with Mt Hotham recording 94.4 millimetres (mm) in 24 hours. This caused further riverine flooding in the north east. The end of the month brought more heavy rainfall across the state and major flooding in the Loddon and Avoca rivers, again flooding Charlton. December brought heavy rainfall in the west of the state and parts of the north. Major flood warnings were issued for a number of rivers in the north east, with many other rivers experiencing moderate flooding.

Persistent low pressure systems and extraordinary tropical moisture led to Victoria recording its wettest January on record. This triggered flood events that were even more severe and widespread than those of September, affecting four times as many properties and over 100 towns, including the major regional centres of Charlton, Echuca, Horsham and Kerang. Between 9 and 15 January 2011, rainfall totals of 100 to 300mm were experienced across two-thirds of the state. The rainfall initially caused flash flooding across western and central parts of the state and subsequent major and moderate flooding spanning north, west and central Victoria.

Once the downpour began to subside, the cumulative effects of unprecedented multi-day rainfall totals quickly caused the Avoca, Campaspe, Loddon and Wimmera river systems to swell. Despite clearing conditions, flooding continued to spread during January and into February 2011 as it developed into what was described by the media as an 'inland sea' across agricultural north west Victoria. In early February, heavy rain and thunderstorms again affected much of the state with widespread flash flooding reported around the Melbourne metropolitan area and Mildura, which recorded a daily rainfall total of 147.4mm, most of which fell in just a few hours.

From September 2010 through February 2011, the BoM issued more than 1500 flood watches and warnings. Several communities experienced flooding two and three times in less than four months.

There has been speculation as to whether the extreme weather events which led to the recent floods were caused by human induced climate change. It is not within the Terms of Reference for this Review to address this issue. Irrespective of the causal factors, this Review is focused on ensuring that Victoria is better able to manage such events in the future.

## The impact of the 2010–11 floods<sup>7</sup>

The impact of the floods from September 2010 to February 2011 was far reaching. Approximately one-third of Victoria, including 70 local government areas, experienced some form of flooding or storm damage, resulting in enormous cost and disruption to regional, urban and rural communities.

Along with the substantial impact to residential property and townships, significant loss, damage and isolation to rural properties and farms was experienced. Widespread horticultural damage and loss, crop disease, soil movement and erosion, stranded and lost livestock and fodder loss occurred.

Throughout the floods, a wide variety of damage occurred to local community infrastructure (including public buildings and roads), essential services (such as water, electricity and telecommunications) and environmental/public health issues (resulting from septic overflows). Numerous disruptions to public transport and dedicated freight services also occurred.

As at 12 October 2011, the estimated gross total cost of these floods is nearly \$1.3 billion (this amount may further increase as damage to assets are assessed). For example, VicRoads has found that new damage to some roads has been identified following an initial repair. This figure includes direct costs to local government authorities, CMAs, government departments, agricultural losses, repair and restoration costs and other recovery measures.

The Insurance Council of Australia reports:

- a total of 56,791 claims have been made to insurance companies (49,000 metropolitan and 7791 rural/regional) to the value of \$836.1 million (\$662.6 million metropolitan and \$173.5 million rural/regional) – this includes vehicles, property, domestic, commercial and business interruption
- 100 per cent of assessments are complete with 98 per cent of claims having been finalised.

Many of the impacts of these floods are still being felt, including the ongoing psychological toll on communities and individuals. It is clear that the recovery of some communities and individuals will continue for some considerable time.

A detailed list of the quantifiable impact of these floods is at Appendix 1 of this report.<sup>8</sup>

7 Source: Secretaries' Flood Recovery Group - Impact of floods data as at 12 October 2011

8 ibid

# Approach to the review

## Establishment of the Victorian Floods Review office

Following the public announcement of the VFR, an office was established for the business of the VFR at Level 2, 121 Exhibition Street, Melbourne.

The following staff were seconded to this office to undertake all of the responsibilities of the VFR:

- Mark Stephens (team leader) – Office of the Emergency Services Commissioner (OESC)
- Superintendent Steve Gleeson – VicPol
- Paul Bennett – Director, DSE
- Commander Martin Braid – Metropolitan Fire Brigade (MFB)
- Pam White – Former CEO, Victorian Bushfire Reconstruction and Recovery Authority
- Laura Vickers – Senior Solicitor, Victorian Government Solicitor's Office
- Heather Lakin – OESC
- Myles O'Reilly (to 12 August 2011) – OESC
- June Gray – Personal Assistant to Chair of the Review.

I wish to record my gratitude to the VFR team who have undertaken their duties with great commitment and professionalism. The conduct of this Review has involved extensive travel and long hours to ensure that all available evidence was gathered to inform the recommendations in this report.

## Establishment of website

Early in the establishment of this Review, a VFR website was developed. The community was advised of the establishment of this website [www.floodsreview.vic.gov.au](http://www.floodsreview.vic.gov.au) by media release on 3 March 2011. The website was a central point to obtain information on community consultation meetings, contacting and making submissions to the VFR and a means for the community and other interested parties to access information relating to the VFR. The VFR Interim Report was published on this website.

## Invitation of submissions

From 3 March 2011, the VFR sought written submissions from individuals, businesses, organisations, local government and other interested parties who wished to provide information relating to their flood experience, views or knowledge. A closing date of 27 May 2011 was determined to allow sufficient time for submissions to be prepared and to enable the VFR to analyse the issues and information provided. Submissions could be provided by email, post or submitted online via the VFR website.

More than 150 written submissions were received, covering a range of matters relevant to the Terms of Reference for the VFR.

A list of organisations and agencies that provided written submissions to the VFR is recorded at Appendix 2. For reasons of confidentiality, the identity of persons making private submissions is not stated.

## Letters to all relevant government agencies and other interested parties

Formal letters were sent to relevant government and non-government agencies and organisations advising of the establishment of the VFR and to detail the Terms of Reference for the Review. These agencies and organisations were invited to make submissions to the VFR.

# Review activities

The thoughts, experiences and views of the community were fundamental to informing this Review and this was the key focus of the initial work undertaken by the VFR. Consequently, the process adopted by the VFR through extensive community consultation has provided the opportunity for individuals and communities to tell their story. This input was supported by information obtained from consultation by the VFR with local government in flood affected areas.

It was also important for the VFR to understand what Victoria's permanent paid and volunteer emergency service agencies experienced during the flood events at the local, incident control, regional and state management levels. In addition, across Victoria there are a number of organisations involved in flood planning, emergency response and in overseeing recovery. The VFR actively sought input from these organisations.

A number of the Terms of Reference for this Review required an assessment of adequacy of certain arrangements or activities. Adequacy in its simplest form can be interpreted as sufficient for its intended purpose. However, these arrangements or activities have now been assessed against the experiences of the 2010–11 floods where they were 'stress tested' in a pressured environment. This assessment provides a more meaningful picture of adequacy. Consequently, the VFR has examined relevant legislation, policy, procedures, systems and structures to assess whether these arrangements meet community expectations and provide Victoria with an appropriate framework to effectively manage large scale emergencies.

In accordance with the Terms of Reference for the Review, the VFR sought advice and input from technical experts in the field of flood management related to the TFWS in Victoria, the operation of storages during the floods and specific technical information where required.

Where appropriate the VFR also sought legal advice relative to statutory interpretation issues.

## Community consultations

Community meetings were held as early as possible in the review process to ensure that relevant issues were captured while still fresh in people's minds. However, recognising that some communities were still responding to the floods or in the early phases of recovery, meetings in some areas were deferred to a more appropriate time.

These meetings provided an opportunity for individuals from flood affected communities to discuss their experiences and views about key issues and to identify the best way to manage future major flood events in their locations.

Community consultation meetings were held in 17 locations during March, April, May and early June of 2011 (see figure 1). Meeting locations were selected to provide the VFR with an opportunity to hear a broad spectrum of community issues, experience and knowledge based on a range of flood events and flood impact across the state. Local councils assisted in identifying appropriate centrally located areas to hold the consultations, in addition to advising on venues and recommended days to avoid clashes with other community activities. Community consultation meeting details were promoted through local government networks, listed on the VFR's website and advertised through local newspapers. Approximately 550 people attended the community consultation meetings.

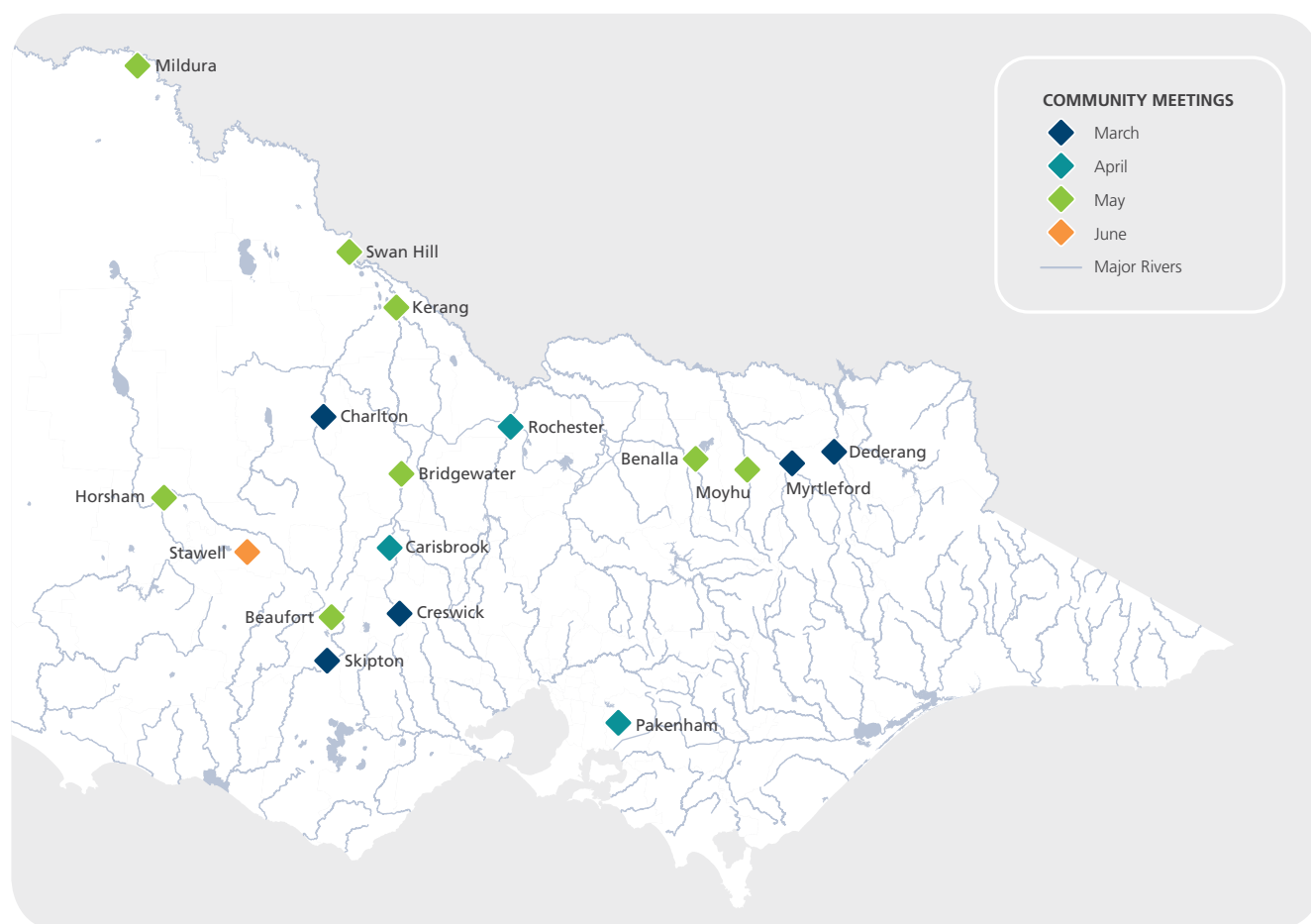
The community meetings were of approximately two hours duration and led by independent facilitators on behalf of the VFR. These facilitators were very experienced in this role as they had previously facilitated the VBRC community consultations. The VFR posed three simple, yet wide ranging questions of participants:

- What worked well?
- What didn't work well?
- What should we do differently in the future?

While the community consultations focused on the VFR's Terms of Reference, community members were neither prevented or discouraged from raising any issue related to the mitigation and management of floods. The information gathered during the community consultation meetings was of considerable assistance in informing future avenues of inquiry of the VFR.



Figure 1 – Map of Victoria showing locations of community consultation meetings



### Community consultation themes

Although specific local issues were raised at each meeting, consistent themes emerged and were expressed in the majority of meetings. These included:

- general desire for flood gauges/monitoring systems
- need for flood studies
- the timeliness and sufficiency of warnings to some residents
- lack of locally relevant, informative flood advice and information
- general confusion regarding the various descriptive terms used in flood and flood information
- a strong desire to understand what a flood and the consequences of flood means to individuals
- late or, in many locations, no Emergency Alert warning, particularly to those residing outside towns
- confusion about who was 'in charge' of managing the flood response at different locations
- no clear understanding about where responsibilities lay before, during and after a flood
- poor road closure information
- recognition of the value and efforts of volunteers from the emergency services and other organisations
- lack of capacity and capability of VICSES to manage and undertake flood response in many locations
- inadequate access to sandbags and lack of knowledge about the filling and use of these bags in some locations
- maintenance and ability of drains to cope with flood waters
- the use of reservoirs and dams for flood mitigation purposes
- positive feedback about the establishment and operation of relief centres

- general acceptance that communities had worked well to deal with the flood impact and in the recovery phase and that community spirit was a positive factor
- insurance related issues and the effect that these problems had on the ability of many people to recover from the impact of the floods
- inadequate planning and preparation in some municipalities
- emergency funding available to individuals was appropriate and well managed
- concerns about the restrictive criteria applied to business/farming related grants and the delays in being able to access these grants
- confusion about where individuals could seek authoritative advice regarding their eligibility for grants
- the importance of local knowledge in the planning, preparation and management of flood events was stressed
- difficulty in providing or ignoring local knowledge by those thought to be 'in control'
- drought leading to general complacency around the potential for floods.

## Local government consultations

Local government has a range of responsibilities within Victoria's emergency management arrangements which are described in legislation such as the *EM Act*, the *Country Fire Authority Act 1958*, the *Metropolitan Fire Brigades Act 1958*, the *Water Act* and the *Health Act 1958* while other responsibilities are designated through the EMMV. The EMMV outlines the role of municipalities in prevention, mitigation and risk reduction, response and recovery.

While local government is not the lead agency to respond to any emergency, it has a support role for a range of emergencies including bushfires, flood, earthquakes and dam safety. Councils also play a significant role in the recovery from any emergency.

The VFR undertook meetings with local government representatives, including staff and councillors, to learn first hand the experiences of municipalities through the flood events. In most cases, the full gamut of flood and emergency management issues, including relief and recovery, were canvassed in these discussions. A number of local governments made written submissions to the VFR.

Municipalities consulted included:

- Benalla Rural City Council
- Buloke Shire Council
- Shire of Campaspe
- Cardinia Shire
- Central Goldfields Shire Council
- Corangamite Shire
- Gannawarra Shire Council
- Hepburn Shire Council
- Horsham Rural City Council
- Loddon Shire Council
- Mildura Rural City Council
- Northern Grampians Shire Council
- Pyrenees Shire
- Swan Hill Rural City Council
- Rural City of Wangaratta.

More detailed discussion on the role of local government in emergency management is found in Chapter Six of this report.

## Local government consultation themes

Many councils undertook or participated in meetings with community members during and after the floods. Depending on the type, duration and timing of the floods, the experience of individual councils differed slightly and particular local issues existed. Similar to the community consultations, consistent themes were raised by councils. The themes included:

- lack of flood studies
- lack of appropriate river gauges
- concern over confusing terminology used in floods to describe the dimension (height/volume) of floods
- differences in the way river heights are expressed
- apparent widespread indiscriminate use of the EA warning system
- concern over the capacity and capability of VICSES to manage the response to large events
- limited agency resources to undertake the required incident management and support roles
- apparent lack of coordination between agencies
- availability, timeliness and accuracy of road closure information
- disconnect between incident control centres (ICCs) and Municipal Emergency Coordination Centres (MECCs)

- incident control apparently ignoring, discounting or not using local knowledge
- communication difficulties between agencies and centres
- lack of clarity of roles and responsibilities
- difficulties in information exchange, data collection and availability
- coordination of spontaneous volunteers during the flood event
- funding assurance to undertake immediate recovery works, such as clean up
- difficulty identifying those community members, particularly farmers, who required psychosocial and other support services
- limited council capacity to undertake roles during large scale and protracted events
- limited experience or training in emergency management of council staff
- acknowledged lack of municipal flood plans
- reconsideration of local planning schemes
- inadequate protection of essential community infrastructure such as power sub-stations
- criteria and processes for emergency and other individual grants to affected households and individuals
- requirements to use contractors for restoration works
- understanding, applicability and practicality of the 'betterment' component in claiming reimbursement for asset repairs
- general availability of information on the range of grants and funding assistance available following an emergency.

## Multi-agency operational debriefs

Between February and May 2011, 13 multi-agency ICC and emergency management team (EMT) debrief sessions were held across regional Victoria by the VFR.

### Multi-agency debrief locations

Ballarat ICC	Stawell EMT
Horsham ICC	Southern Metro (Mulgrave) EMT
Bendigo ICC	Bendigo EMT
Swan Hill ICC	Geelong EMT
Geelong ICC	Wangaratta EMT
Wangaratta ICC	Traralgon EMT
	Mildura Divisional Command/MECC

At the state level, a combined State Control Centre (SCC), state EMT and agency senior management debrief was conducted. In addition, debriefs of the individual SCC functional cells (logistics, resources, intelligence, information) were held, as well as specific debrief sessions on rapid impact assessment, management support and SCC facilities.

An independent facilitator, sourced from the Australian Emergency Management Institute, managed the ICC, regional and state level debriefs. The VFR team managed and facilitated the SCC functional cell debrief sessions.

Approximately 300 emergency management organisation or agency staff attended the debrief sessions. Non-government organisations, such as the Australian Red Cross, also participated.

Attendees were required to focus on operational matters and frank discussion was encouraged. The stated aim and objectives of the debrief sessions were:

### Aim

- to improve the state's capacity to manage floods.

### Objectives:

- to understand the issues and pressures on staff during the floods
- to identify what worked well
- to identify what had not worked well
- to identify opportunities for improvement.

Debriefs sought information on preparedness, response and incident management and recovery. Significantly more information was provided in relation to the response phase of the flood events due to many attendees being from emergency service organisations (VICSES, CFA, VicPol) and because recovery in many regions was still in its early phase and hence difficult to evaluate.

### Multi-agency operational debrief themes

A range of common themes emerged from the multi-agency debriefs that were undertaken by the VFR, including:

- circulation of incident action plans across agencies being difficult due to incompatible systems
- an inability to sustain staffing at level three ICCs beyond a single shift
- inconsistent staffing levels and lack of experienced staff in key roles within some ICCs
- de-escalation occurring in some incident control teams due to fatigue
- some EMTs found it difficult to remain strategic and therefore became focused on incident management
- identification of appropriate representatives to attend regional EMT meetings
- senior regional staff being utilised at incident operational level rather than the EMT strategic level
- some MECCs operating as pseudo ICCs and being operationally focused
- control centres being established based upon staff availability rather than consideration of the nature and extent of the event
- a lack of emergency management liaison officers
- flood updates and information from the ICCs and relevant authorities was difficult to obtain
- a lack of qualified, experienced staff and poor understanding of the role of MECCs
- IT systems within ICCs not supporting multi-agency response
- some level three ICCs utilised during the floods were set up for fire with only separate DSE and CFA systems
- no common operational platform on which to operate to facilitate interagency communication
- a belief that the EA system was overused
- differing understanding regarding the authorisation and releasing of information and warnings through the EA system
- warnings not matching what was happening on the ground
- acceptance of the importance of the rapid impact assessment process but lack of clarity about where it sits in the incident management structure
- concern about access to information to assist in developing strategies and tactics
- transition from response to recovery did not always work well
- specific roles in the evacuation process and the mechanism for identifying those at greatest risk

- not all municipalities have flood emergency plans despite being located on floodplains or having a known flood risk
- flood plan development not involving all relevant agencies
- community awareness programs not linked to MEMPs.

Recovery issues were more fully addressed in subsequent consultations with relevant agencies and organisations and written submissions were also considered.

### Inspection of flood affected locations

In conjunction with the meetings with municipalities, community consultations and regional multi-agency debriefs, the VFR took the opportunity to inspect flood affected areas across Victoria. This enabled the VFR to gain considerable insight and understanding of the impact and extent of the floods on communities, agriculture, infrastructure and the landscape.

### Consultation with the Environment and Natural Resources Committee Inquiry

The Victorian Government also requested the Environment and Natural Resources Committee (ENRC) of Parliament to undertake a separate inquiry into flood mitigation. ENRC has been tasked to identify best practice and technology for flood mitigation, monitoring infrastructure and levees across Victoria. The VFR met with the ENRC and agreed on protocols for the exchange of information between the parties. It was important that matters raised by community members or agency staff relevant to either the VFR or the ENRC Inquiry, including technical information, were shared.

### Input to State Coordination and Management Council (SC&MC) Bushfire Sub-Committee

It was appropriate that if shortcomings of substance or ongoing risks were identified in the course of the VFR that immediate action was taken to address such issues outside of scheduled formal reports and subsequent recommendations. In the absence of any other high level emergency management focused forum, the VFR considered that, due to the cross-departmental, multi-agency senior representation of the SC&MC Bushfires Sub-Committee, chaired by the Secretary of the Department of Justice (DOJ), this was the most appropriate forum at which to raise matters of significance.

The VBRC found that bushfires exposed a series of systemic shortcomings that impeded incident and emergency management in Victoria. The VBRC identified a number of primary concerns relating to command and control, information flow, community warnings, training, exercising, coordination and agency integration.



In its final report, the VBRC made a number of recommendations including establishment of uniform incident controller accreditation, appointment of competent incident controllers regardless of control agency, appropriate location of coordination function and standardised operation and communication technologies to achieve greater efficiency and interoperability.

Early in the work of the VFR, through the agency debriefs, discussions with local government and the community consultations, it became apparent that the extent to which the state can sustain incident management capacity and capability, either in terms of significant rapid onset or sustained large scale ongoing events, is of serious concern.

In many regions across the state, water storage levels are at or near capacity, with a low level of demand. It is envisaged that storage levels will remain high, therefore providing limited flood mitigation capacity. When coupled with saturated catchment areas, the risks of further flooding cannot be ignored, nor can the possibilities of other large scale emergencies affecting Victoria.

Despite significant work across government and emergency service organisations in developing a strategy for integrated emergency services, this work is incomplete. Victoria remains without an overarching, appropriately endorsed strategy or framework to integrate preparedness, mitigation, response and recovery across Victoria's emergency services and departments to effectively manage emergencies in a truly 'all hazards, all agencies' manner, irrespective of scale and duration.

There is a pressing need for an immediate improvement of Victoria's incident management capacity and capability within the context of a state emergency management strategy. The chair of the VFR recommended to the SC&MC Bushfires Sub-Committee at its meeting on 5 April 2011 that, as a matter of urgency, the sub-committee initiate appropriate action to ensure that an 'all hazards' incident management capacity and capability is available statewide. This action should focus on the most effective means of managing the event rather than on the agency with current statutory responsibility for control of the hazard in question.

The SC&MC Bushfires Sub-Committee accepted this recommendation and convened a high level workshop of key departmental and agency representatives at which the VFR Chair outlined his concerns.

The VFR understands that arrangements are underway to progress the outcomes of the workshop through the SC&MC Bushfires Sub-Committee, however, the government may wish this crucial work is progressed through an alternative forum or means.

## Detailed information requests to emergency management and stakeholder agencies

The community and local government consultations and multi-agency debriefing afforded the VFR a broad overview of the flood events. They also elicited a variety of suggestions as to how the state's capacity to respond to large scale and or protracted emergency events might be enhanced in the future. Suggested enhancements spanned a diverse array of topics from specific local issues, to structural, systemic and emergency planning related matters, including training exercises and governance arrangements.

To enable the VFR to further explore the merits of suggested enhancements, detailed requests for information were provided to the various stakeholder agencies seeking their views on the operation and functionality of current state level and specific agency emergency management arrangements to contend with floods.

Detailed requests for information were provided to stakeholder departments and agencies including:

- Ambulance Victoria
- Australian Defence Force (ADF)
- Australian Red Cross
- BoM
- CFA
- Department of Planning and Community Development (DPCD)
- Department of Primary Industries (DPI)
- Department of Treasury and Finance (DTF)
- DH
- DHS
- DSE
- MFB
- Murray Darling Basin Authority
- OESC
- VicPol
- VicRoads
- VICSES
- Victorian Managed Insurance Authority.

In a number of instances, further consultation was undertaken by the VFR with these organisations, to either clarify responses or explore further details regarding the information they provided. The responses received to these detailed requests have been considered and factored in to the comments and recommendations in this report.

## Media briefings

Media support for the VFR was provided by DOJ's Strategic Communication Branch. The VFR issued media releases to announce the dates of community consultation meetings and call for submissions. Local media was used extensively to promote the community consultation meetings.

The VFR Chair has undertaken a number of radio and television interviews to discuss community consultation meetings and the work of the Review, as well as being available for and giving a number of interviews following community consultation meetings.

## Queensland floods

Significant flooding occurred in many areas of Queensland during late December 2010 and early January 2011, with three-quarters of the state declared a disaster zone. Tragically, a number of lives were lost in these floods. An independent Commission of Inquiry ([www.floodcommission.qld.gov.au](http://www.floodcommission.qld.gov.au)) was established by the Queensland Government to examine this unprecedented flood disaster. The Commission of Inquiry delivered an *Interim Report* in August 2011, covering matters associated with flood preparedness to enable early recommendations to be implemented before next summer's wet season. The final report of the Commission of Inquiry will be delivered in February 2012.

There are a number of issues being addressed by the Queensland Floods Commission of Inquiry that are of common interest to the VFR and ENRC Inquiry. Consequently, the VFR met with the Queensland Floods Commission of Inquiry to discuss these areas of mutual interest, to share knowledge and explore the potential for further research. The VFR has made a number of references in this report to matters raised in the Queensland Floods Commission of Inquiry's *Interim Report*. It will also be useful for Victoria to consider the findings and recommendations in the final report of the Queensland Floods Commission of Inquiry when this is released in 2012.

The VFR also met with representatives of the Queensland Police Service, Department of Community Safety, Brisbane City Council and the Queensland Reconstruction Authority to discuss relevant aspects of flood and emergency management in order to capitalise on their experiences and learnings.

## Analysis of information from consultations, written submissions and agency responses

Following the initial phase of the VFR, which involved a broad range of consultations, receipt of written submissions and detailed responses from stakeholder departments and agencies, the VFR engaged in an extensive work program to analyse all of the information gathered through this process.

This comprehensive analysis revealed many facts and issues that then became the subject of further investigation and consultation by the VFR.

It is worthy of note that despite the very broad range of research activities undertaken by the VFR, similar themes and issues emerged from a variety of sources. The consistency of these themes and issues provided some confidence to the VFR that these were the matters deserving of focused consideration with regard to the future direction of emergency management in Victoria. Indeed, many of these themes and issues have become the subject matter of the recommendations in this report.

It also should be noted that the VFR became aware of numerous locally specific issues that could not be adequately addressed in a report of this nature. Nevertheless, the VFR is of the view that many of these local issues will be resolved by the implementation of the strategic recommendations offered in this report.

## Household and business telephone survey

The VFR commissioned an extensive telephone survey of householders and business owners affected by the floods. The survey, which was conducted by Strahan Research Pty Ltd, provided further insight about flood experiences and expectations concerning assistance and advice.

Over 1000 householders and 500 business owners across 40 rural towns and 16 metropolitan Melbourne suburbs were surveyed. This has provided appropriate statistical confidence in the data and outcomes. The survey area included those flood affected locations where a community consultation meeting by the VFR was not held. The survey has broadened the extent of community contribution to this Review and has added additional support to the information gathered through community consultations and submissions.

## Review of the TFWS in Victoria

The VFR engaged flood consultants Molino Stewart Pty Ltd to undertake an examination of the status of the TFWS<sup>9</sup> within Victoria and to understand what is required to achieve best practice in a TFWS in the state. The examination considered all types of flooding that occurred during 2010–11. The examination has focused on strategic aspects of the TFWS encompassing:

- prediction
- interpretation
- message construction and communication
- community and emergency response.

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9 An explanation of the total flood warning system is contained in Chapter One of this report

Due to both the timelines available to the VFR and the widespread flooding, particularly during January 2011, the examination of the TFWS focused on the following Victorian catchments:

- Ovens
- Goulburn-Broken
- Campaspe
- Loddon
- Avoca
- Wimmera
- Mount Emu Creek (Hopkins)
- Bunyip River.

The examination has also considered the current status and efficacy, in light of the 2010–11 floods, of the recommendations of the Victorian Flood Warning Consultative Committee's 2005 Flood Warning Service Development Plan.

### Examination of the operation of storages during the floods

On the basis of concern raised with the VFR during the community consultations about the effect of the operation of storages on the flood events, the VFR engaged Sinclair Knight Merz Pty Ltd to examine the governance arrangements, operation of storages and the role of dam owners and operators in providing information to communities and the control agency<sup>10</sup> during the flood events. The examination focused on three of the systems of community concern:

- Lake Eppalock (Campaspe River System)
- Cairn Curran Reservoir, Tullaroop Reservoir and Laanecoorie Reservoir (Loddon River System )
- Wartook Reservoir and Lonsdale Reservoir (Wimmera River System).

It should be noted that no technical investigations were undertaken into the potential for future alterations to the operation of water supply infrastructure (including dams, weirs and water supply distribution and drainage systems) for flood mitigation purposes as this is outside the scope of the VFR's terms of reference.

### Flood management advice

In addition to the specific examinations undertaken, the VFR sought expert technical advice and input relating to flood management, where appropriate, from consulting hydrologists Michael Cawood and Associates.

### Readers guide

In addressing the Terms of Reference for this Review, the VFR has been required to address several issues that are relevant to more than one term of reference. This situation particularly applies to Term of Reference One – *The adequacy of flood predictions, including technology and modelling techniques used* and Term of Reference Two – *The adequacy, timeliness and effectiveness of flood warnings and public information*.

To reduce duplication, wherever issues of substance are referred to on more than one occasion in this report, the issue will be discussed at length in the first instance and on subsequent instances, referral is made back to this detailed discussion. Emergency management command and control arrangements, however, are initially mentioned in Chapter One, but these arrangements are more fully detailed in Chapter Three.

A synopsis of the issues addressed in each of the following chapters is provided to assist the reader in navigating this report.

Chapter One considers the adequacy of flood predictions and modelling, specifically:

- the concept of the TFWS
- the weather and flood predictions process, including how rain and river data is collected
- flash flood warning systems
- interpreting data and predictions to provide intelligence into emergency management
- availability, extent and quality of flood mapping
- incorporating local and informal information into flood management
- dam operations and communication
- information gathering post floods
- statewide information management systems
- modelling and technology advances.

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<sup>10</sup> Control agency is described in Chapter Three of this report

Chapter Two considers the timeliness and effectiveness of warnings and public information, specifically:

- flood awareness and education
- the content of flood warnings
- the range of warnings used, including telephone warnings and community meetings
- community participation in preparation and response
- sources of local knowledge
- the use of social media during the floods
- partnerships with broadcast media.

Chapter Three considers emergency services command and control arrangements, specifically:

- the relevant legislation and policy including recent developments
- incident management systems
- incident level categorisation
- tiers of management
- command, control and coordination
- ICCs and EMTs
- the role of the Victorian Emergency Management Council (VEMC) and other state committees
- statewide and control agency capacity
- interoperability issues, including communications, resource management systems and processes, records management, processes for warnings, the SCC and procurement
- emergency response planning
- addressing operational legal issues
- water/swift water rescue
- leadership
- training and exercising.

Chapter Four considers the adequacy of evacuations of people most at risk, including those in health and aged care facilities, specifically:

- ‘vulnerable people’, including their inclusion in MEMPS, the terminology used and the special situation of caravan parks
- importance of an ‘all hazards’ focus for evacuations
- planning for evacuation.

Chapter Five considers the adequacy of clean-up and recovery efforts, specifically:

- lack of clarity regarding clean-up responsibilities
- insurance
- local government clean-up issues
- rapid impact assessments
- volunteers
- relief and recovery centres
- cross-border issues
- information collection and sharing, including privacy and the National Registration and Inquiry System
- outreach
- longer term recovery packages
- housing
- public health
- transition to recovery.

Chapter Six considers the adequacy of service delivery by federal, state and local governments, specifically:

- emergency management plans at all levels, and their audit
- the role of the commonwealth and its agencies, including the ADF
- protection of essential services, particularly electricity
- land use planning and building codes
- the role of local government in emergency management.

Chapter Seven considers the adequacy of funding provided by state and federal governments for emergency grants, specifically:

- financial assistance to individuals
- financial assistance to local government
- improved information and support for councils
- the state disaster funding arrangements
- the national arrangements
- financial assistance to business/primary producers
- the Red Cross Appeal Fund
- access to information on grants and assistance for individuals and businesses.

Chapter Eight discusses community resilience and shared responsibility.



# Chapter 1

The adequacy of flood predictions,  
including technology and  
modelling techniques used





Commonwealth and Victorian government agencies have long recognised the need to improve their systems and processes to ensure that communities receive timely and relevant advice to assist them to take appropriate action when confronted with emergencies.

While it is not possible to stop major flooding, effective warning can significantly reduce flood damage. It has been estimated that up to 80 per cent of potential flood damage within buildings in urban areas could be avoided if people were better warned, knew what to do when a flood was bearing down upon them and were persuaded to act accordingly.<sup>11</sup> In rural areas, actions such as moving vehicles, farm machinery and stock can also significantly reduce damage.

Underpinning the decision to warn and the construction of such warning messages is the ability for agencies to rapidly analyse on the ground intelligence, monitor emerging risks, predict future impacts and decide the best course of action. This includes flood intelligence systems which are used to interpret flood predictions made by the BoM to determine what the potential consequences of a flood will be and who will need to be warned.<sup>12</sup>

The importance of warnings to protect life and property underpinned by high quality information and intelligence was highlighted by the VBRC, which concluded:

*The evidence before the commission has demonstrated that the community depends on (and has come to expect) detailed and high quality information prior to, during and after bushfires. In addition, the community is entitled to expect to receive timely and accurate information whenever possible, based on the intelligence available to control agencies.<sup>13</sup>*

The VFR heard from affected communities that they were dissatisfied with the accuracy and timeliness of flood warnings and where, in some instances, warnings appeared to be non-existent. On the other hand, there was a sense of appreciation that the task of predicting the events that unfolded was almost impossible in some areas as communities faced flooding directly from rivers, flash flooding arising from thunderstorms in the immediate area and overland flows.

Predictions of flooding also enable emergency service organisations to establish command and control arrangements prior to an event and to mobilise resources to aid communities, including evacuations where necessary. The VFR also heard that emergency service organisations found it difficult to plan due to limited information on flood behaviour.

It is important to note that the establishment of a flood warning system is only one of the flood mitigation options available to communities. The necessity for flood warning systems is reduced in areas where floodplain development has occurred consistent with the level of flood risk, for example, building construction above flood levels.

The VFR believes there is sufficient evidence to demonstrate improvements are required to governance arrangements (roles and responsibilities), processes and the technology that underpin flood warnings. Consequently, this report does not attempt to evaluate each prediction or interpretation for the flood events. Rather, it draws on the experiences and expectations of communities, emergency service organisations and government agencies to identify systemic and fundamental blockages to the state having a best practice flood warning system.

## Total flood warning system

Flood warning is one of a range of structural and non-structural flood management strategies available to reduce flood risk.

In 1995 the Australian Emergency Management Institute, following a national review of flood warning practices after disastrous flooding in the eastern states in 1990, published a best practice manual entitled *Flood Warning: an Australian Guide*. In describing practices for the design, implementation and operation of flood warning systems in Australia, the manual introduced the concept of the TFWS. While the manual was updated in 2009, the TFWS concept remains a central theme.

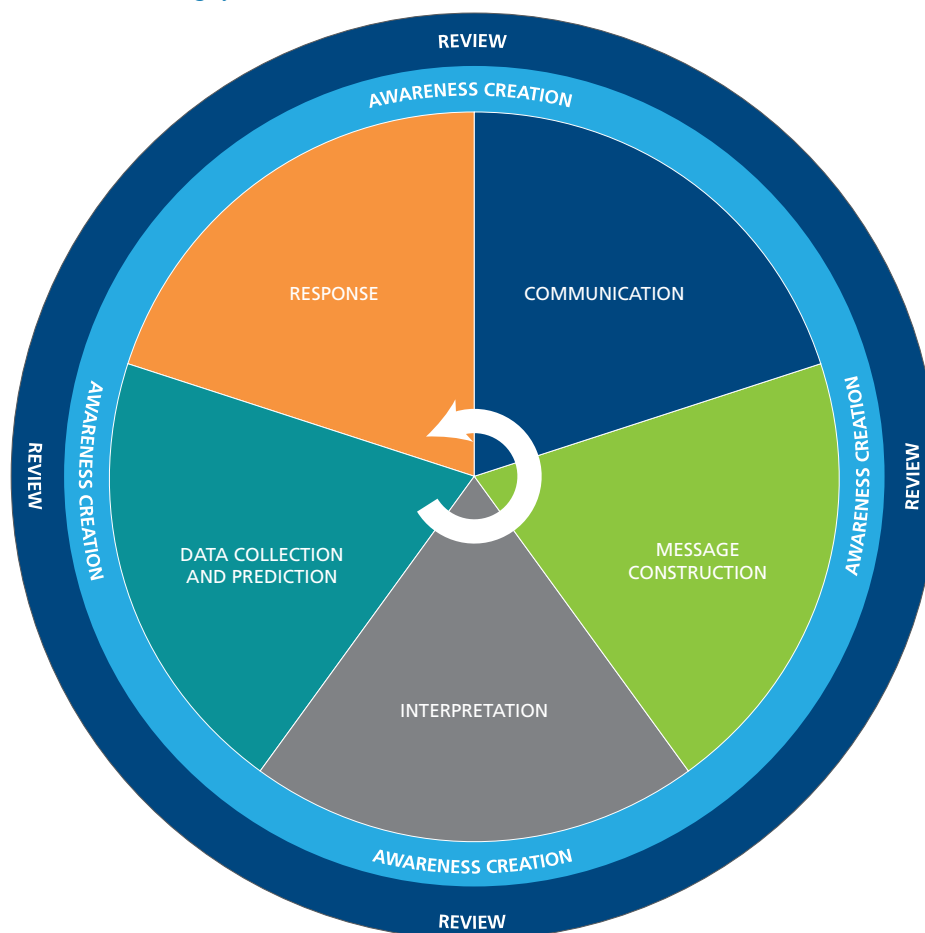
The TFWS concept is shown in diagrammatic form in figure 2 and as a series of building blocks in Appendix 3. Both demonstrate the many interests that must be brought together to create an effective flood warning system. This requires skills no single agency is likely to be able to provide. They both show the need for several agencies to play a part, with clearly defined roles, linked operational responsibilities and overlapping but carefully integrated functions. The importance of involving members of the communities at risk of flood in this process is also recognised.

11 Wright and Smith, 1999, cited in Bureau of Infrastructure, Transport and Regional Economics, Report 106, *Benefits of flood mitigation in Australia*, May 2002

12 Australian Fire and Emergencies Authorities Council. *A National Systems Approach to Community Warnings – Discussion Paper*, September 2009, p 11

13 2009 Victorian Bushfires Royal Commission, Victorian Bushfires Royal Commission Interim Report, Parliament of Victoria, August 2009

Figure 2<sup>14</sup> – The total flood warning system



The concept also makes it clear that implementing a flood warning system is not just a matter of installing a number of rain and river gauges, developing a forecast tool and providing predicted flood levels and times to key agencies and communities.

Flood warning system effectiveness can be measured by considering whether people have:

- received timely and accurate information
- understood that information and appreciated what it means for them

- been prompted by the information to initiate relevant damage reducing or safety enhancing actions (for example, by avoiding flooded or closed roads, moving property and/or livestock, evacuating to a suitable location) within timeframes appropriate to the circumstances.

Predictions of the likelihood of flooding are ideally based on an objective assessment and consideration of flood forecast and observed rainfalls, observed stream flows and levels, existing catchment conditions and current information on storage operations.

14 Derived from Emergency Management Australia, *Flood Warning*, Australian Emergency Manual Series Part 3 (Emergency Management Practice) Volume 3, Guide 3, Manual 21

The most commonly used flood forecast techniques in Victoria are:

- stream height and flow correlations which provide an estimate only of the peak height and flow at a location
- rainfall runoff models which provide a predicted hydrograph (the height or flow of water at a location plotted against time) from which the exceedence of critical levels as well as peak height (or flow) and the time of occurrence can be determined for the forecast location.

While only the rainfall runoff model can accommodate the factors listed above, both predictive tools provide a forecast of likely flood level (or flow) at a location. It is this information that is currently generally provided in flood warning messages. Flood impacts and response, however, occur over an extensive area. Additional intelligence relating to the likely flood impact is required in order to ensure maximum value from the flood prediction.

Although there is a clear and well understood definition of the term 'prediction', a broader interpretation of the Terms of Reference was used by the VFR in order to capture and review the governance, arrangements and technical processes used to prepare flood predictions and to collate and use the intelligence that assists in deriving maximum value from those predictions.

The VFR has adopted the term 'flood warning network' to encompass the technical information base, processes and tools that support flood warning activities and that includes data collection, flood prediction and interpretation (refer Figure 2). Important components of the flood warning network include:

- rainfall and stream gauges
- tools such as radar and satellite images to detect and quantify weather phenomena
- models that convert rainfall into potential river heights
- flood mapping which converts river heights into areas and assets likely to be flooded
- the flood intelligence that underpins response planning and operational decisions as well as agency and community awareness
- statewide, regional and community flood planning.

The adequacy, timeliness and effectiveness of flood warnings, including dissemination and public information, are further discussed in Chapter Two.

## Weather and flood predictions

The following provides an introduction to the importance of weather and rainfall forecasts to the development of flood predictions and warnings.<sup>15</sup>

Reliable forecasts of weather, in particular rainfall, can enable advance warning and forecasting of floods. Weather forecasts for the next one to seven days rely on increasingly accurate computer models of the atmosphere and ocean/ atmosphere interactions.

Radar (and sometimes satellite) images can be useful for tracking areas of heavy rain and their movement. Rainfall in the next one to four hours may be forecast based on these images in combination with computer models. However, such forecasts give only a very short lead time (the time between when a forecast is made and the forecasted event occurs) for response.

The accuracy of climate and weather forecasts varies with lead time, spatial scale (or size) of the region of interest, the weather or climate variable being forecast (for example, rain, thunderstorm), as well as the forecast latitude.

It is generally easier to forecast when the lead time of the forecast is relatively short. Therefore, a seven day forecast is usually less accurate than a forecast of tomorrow's weather. Additionally, it is generally easier to forecast rainfall over a large area than local rainfall (for example, over a small catchment). This is because the intensity of any rain system varies on small spatial scales, but the variation is averaged out when the rainfall is over a large area.

Rainfall forecasts can be used to extend the lead time for flood forecasts. However, because forecasts of rainfall for specific locations and timing are not fully accurate, flood forecasts based on rainfall forecasts are often subject to significant uncertainty.

Flood forecasts are critical to emergency responses to limit property damage and avoid loss of lives.

Flood forecasters rely heavily on real time data about rainfall and river water levels as well as rainfall forecasts.

A network of rain gauges (sometimes combined with radar images) is used to monitor rain that has fallen on the catchment. Water levels (i.e. river height) at stream gauging stations along the river are also measured. The forecasters then use hydrological computer models to work out how much rainfall will run off different parts of the catchment, how long it will take for runoff to reach the river, how long that water will take to travel from upstream to downstream and how water from different tributaries converge in the river network.

15 Sourced from State of Queensland, *Understanding Floods: Questions & Answers*, Office of the Chief Scientist, Queensland Government, July 2011

Flood forecasters estimate the river flow rate at various key locations and lead times and convert the estimates to river water level forecasts. Flood forecasts by the BoM (Melbourne Water for the Port Phillip and Westernport region) are issued to emergency management agencies and the public through the media and the BoM's website. The forecasters regularly update their forecasts as new observations are made of rainfall and river water level and as rainfall forecasts become available.

Because rain that has fallen on a catchment takes time to travel to the outlet of the catchment, river flow downstream of the catchment within a certain period will largely be influenced by rain that has already fallen on the catchment and been recorded. This means that the river flow forecast for this period will be reasonably accurate. River flow forecasts beyond this period will be less accurate as it is necessary to use rainfall forecasts.

If a critical dam operation is involved in a flood event, the forecasters communicate with dam operators. Decisions about releasing water from dams need to take into account forecasts about how much water will flow into the dam and assessments of how water releases may affect water levels downstream. In turn, flood forecasts for downstream areas need to take into account water release decisions.

Forecasts of river water level are most useful when interpreted in terms of where the water is likely to spread beyond the river. Such interpretations may be provided to the public by local governments and emergency agencies, usually based on pre-prepared flood maps using historical flood data and in some cases floodplain hydraulic models.

New technologies are available, but not yet widely used in Australia, for providing near real time mapping and delivery of forecast flood inundation extent on the internet. These technologies use accurate ground elevation data, robust floodplain hydraulic models, new spatial information technology and internet map-serving software. Adoption of these technologies would significantly enhance the value of flood forecasts in Australia.

Flash floods are difficult to forecast, although technologies are available and used operationally overseas for flash flood forecasting. These technologies are generally based on monitoring of rainfall using rain gauges and radar images, high resolution rainfall forecasts for the next few hours, understanding of the catchment condition (how much rainfall will run off) and understanding of the local drainage systems (how much water is needed to cause a flood).

In summary, a flood warning system consists of a number of key steps: monitoring of weather conditions, rainfall and river flows; making forecasts about water levels and timing of flood peaks; interpreting forecasts for their meaning in terms of flood extent and impact on those at risk; composing and disseminating warning messages; response by those at risk and emergency services; and review and improvement.

## Predictions of flooding between September 2010 and February 2011

The flooding that affected the western part of the state was the most significant in several decades and severely tested Victoria's flood warning capability. In many cases, the recorded flows and levels were the highest on record. In a submission received from Pyrenees Shire Council, the VFR was advised that floods of this magnitude had never happened before and people did not believe the flood levels.

Areas and towns that had not previously been regarded as being flood prone were inundated, in some cases more than once (Creswick and Carisbrook) and in other cases for a considerable period (Lower Loddon from upstream of Kerang to Murrabit and Benjeroop). Water was reported to flow in unexpected directions not previously experienced or did not follow known watercourses. This caused sudden and unexpected damage, along with confusion for authorities and local communities.<sup>16</sup> The floods also highlighted gaps, inadequacies and inefficiencies in flood warning services.

The VFR heard that while floods are entirely predictable in where they will occur and the impacts they are likely to have (provided that flood mapping has been undertaken) we do not know exactly when they will occur or to what magnitude (i.e. their depth and extent). If all elements of the TFWS are in place and operating effectively the 'when' and 'how much' of flooding becomes more straightforward. However, flood mapping that allows the BoM flood height predictions to be translated into potential consequences do not cover a number of the areas that flooded between September and February.

The BoM provided seasonal forecasts indicating that La Niña conditions would continue to dominate across the tropical Pacific with the likelihood of average rainfall across most of Victoria during the period from September through to February.

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<sup>16</sup> Loddon Shire Council submission to VFR, 5 May 2011

Prior to each of the rainfall events that led to the periods of flooding that affected Victoria, the BoM provided advice of the likelihood of flooding through reference to heavy rainfall in district and related weather forecasts and through the issue of flood watches for specific regions. The VFR heard that the rainfall predictions (in terms of total rainfall) were both timely and reasonably accurate. The temporal and spatial distribution of that rainfall, both of which have a significant impact on flash and localised flooding as well as on overall flood behaviour, remains very difficult to predict accurately. This, and the effect of antecedent conditions on runoff production, is why the BoM does not generally issue location specific flood predictions and warnings until rain has begun to fall.

The BoM issued catchment specific flood warnings and location specific flood predictions as the location and scale of each rainfall event became more obvious and runoff became more pronounced.

The BoM does not provide specific flood predictions for many of the locations affected by flooding between September and February. This includes those locations that experienced flash flooding. Other locations lack the flood mapping and/or other detailed information that would enable a prediction to be translated into areas likely to be flooded. This is representative of what many see as a failure of the TFWS.

In the absence of quantitative flood predictions from the BoM and with due regard for the scale of the rainfall events, the CMAs in conjunction with consulting hydrologists, developed flood peak and time estimates for a number of locations. A range of tools were utilised to determine approximate flood inundation extents and identify assets likely to be impacted. Not all estimates were sufficiently accurate and in other cases, estimates were adjusted as more data became available which resulted in some confusion within the at risk communities about the likely severity of expected flooding.

A further impediment to the accuracy of predictions of water movement and peak levels and times, were changes within the landscape as a result of blockages at culverts and other structures, breaks in levees and the construction of temporary levees. These are briefly discussed later in this chapter.

While the BoM predicts flood peaks and times for particular locations, flood mitigation works at a forecast location can change the response to those forecasts. For example, at Swan Hill, the town is protected from flooding by a substantial and well maintained levee. However, the rural communities both up and downstream (Pental Island and Tyntynder Flats) rely on rural levees that provide a lower standard of protection and are not

as well maintained. The VFR heard that the forecast of major flooding at Swan Hill resulted in some unnecessary sandbagging within the town area. While the flood class levels (minor, moderate and major) at Swan Hill may well be appropriate for the rural community, they now have limited relevance to the town. The case for warnings that make the distinction between the rural and township areas is strong.

The VFR heard that, while many people were not satisfied with the predictions and warnings received, others understood the difficulties in predicting the location, severity and timing of flooding. For example, it was suggested at the Swan Hill community meeting that the BoM could not have predicted or modelled this flood as it was so large; the largest outflow from Laanecoorie Reservoir since White Saturday (floods of August 1909). Gannawarra Shire Council supported this comment with the observation that in their area it would be very difficult to develop a computer model for predicting flooding. They are at the junction of three rivers, the area is flat, there are many flow channels and as a result there is need for local anecdotal knowledge to be input to the prediction process, including what crops are growing in various key areas.<sup>17</sup>

Pyrenees Shire Council also noted deficiencies in the flood warning system including the lack of warnings and the absence of upstream gauges that would have assisted in signalling the scale of the event.

The VFR noted that the BoM's flood predictions for a location focus on the peak and time of peak. This focus presents some difficulties for residents of at risk communities and for VICSES. Further, the BoM's tendency to hold off on providing an initial forecast for downstream locations before upstream locations have peaked intensifies these difficulties. When a large flood is threatening, it is suggested that lead time is initially more important than absolute accuracy. Residents and agencies are aware that a large flood is coming but must initiate damage reducing actions in a vacuum with little or no guidance on the possible timing or scale of initial rises and the exceedance of key levels or on peak levels. The VFR understands that this situation results in a reduction in community confidence in the official flood warning system with a consequential 'do nothing' or 'wait and see' approach to impending flood events. In turn, this increases the threat to life and property and the potential for flood related damage. The solution suggested to the VFR on numerous occasions was access to information from additional upstream rain and river gauges. As discussed later in this chapter, adding gauges will not necessarily result in an improved flood warning system.

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17 Gannawarra Shire Council submission to VFR, May 2011



The VFR also heard that many people do not understand what is meant by a 'major' flood or what a particular stream height means for their own property or safety. It was suggested to the VFR that predictions need to include a comparison to a recent similar or memorable event.

While not stated, it was apparent to the VFR that there is a high community expectation that where quantitative flood predictions are provided, they will be accurate. The uncertainty inherent in such predictions is either not understood or not disseminated with warnings. It is the VFR's opinion that such expectations are unrealistic. It is also apparent to the VFR that these unrealistic expectations extend to other elements of the TFWS. People who live on a floodplain or near a watercourse need to be aware that they may be flooded and take responsibility to raise their knowledge of likely impacts as well as of critical levels (or flows). Significant flood related information is available. The state, however, needs to get better at making such information more widely available and ensuring it can be understood.

Due to widespread flooding, it was not possible to look in detail at the predictions and warnings for all river systems. The VFR requested Molino Stewart Pty Ltd<sup>18</sup>, in their examination of the TFWS, to concentrate on eight catchments as major case studies to identify systemic issues with the warning system. The reader is referred to the technical report (available on the VFR website [www.floodsreview.vic.gov.au](http://www.floodsreview.vic.gov.au)) for detailed information on the following river catchments:

- Ovens
- Goulburn-Broken
- Campaspe
- Loddon
- Avoca
- Wimmera
- Mount Emu Creek (Hopkins)
- Bunyip River.

## Arrangements for flood warning systems

Flood management in Victoria is dependent on the coordinated contribution and involvement of affected communities, regional authorities, local government and state and commonwealth agencies. Activities include the identification of flood risk, the implementation of appropriate mitigation measures and the planning for, response to and recovery from flood events (Figure 3).

Flood forecasting, predictions of river heights and understanding of the potential consequences are integral components of prevention and response in flood management.

The arrangements for flood warning networks are outlined in the 1998 Victoria Flood Management Strategy (VFMS) and the Arrangements for Flood Warning Services in Victoria 2001. The VFMS was developed as a long term plan to address Victoria's flood risks. The strategy provided the framework to collate the available data on floodplains and implement measures to reduce the flood risk to communities. The VFMS describes the roles and responsibilities for flood warning including the sharing of the associated costs.

Legislation underpinning the roles and responsibilities of organisations involved in the establishment and maintenance of flood warning systems is generally enabling in nature rather than prescriptive. The establishment of flood warning systems has a history of dependence on cooperation, negotiation and availability of funding, resulting in complex and significantly varying arrangements at a regional or local level.

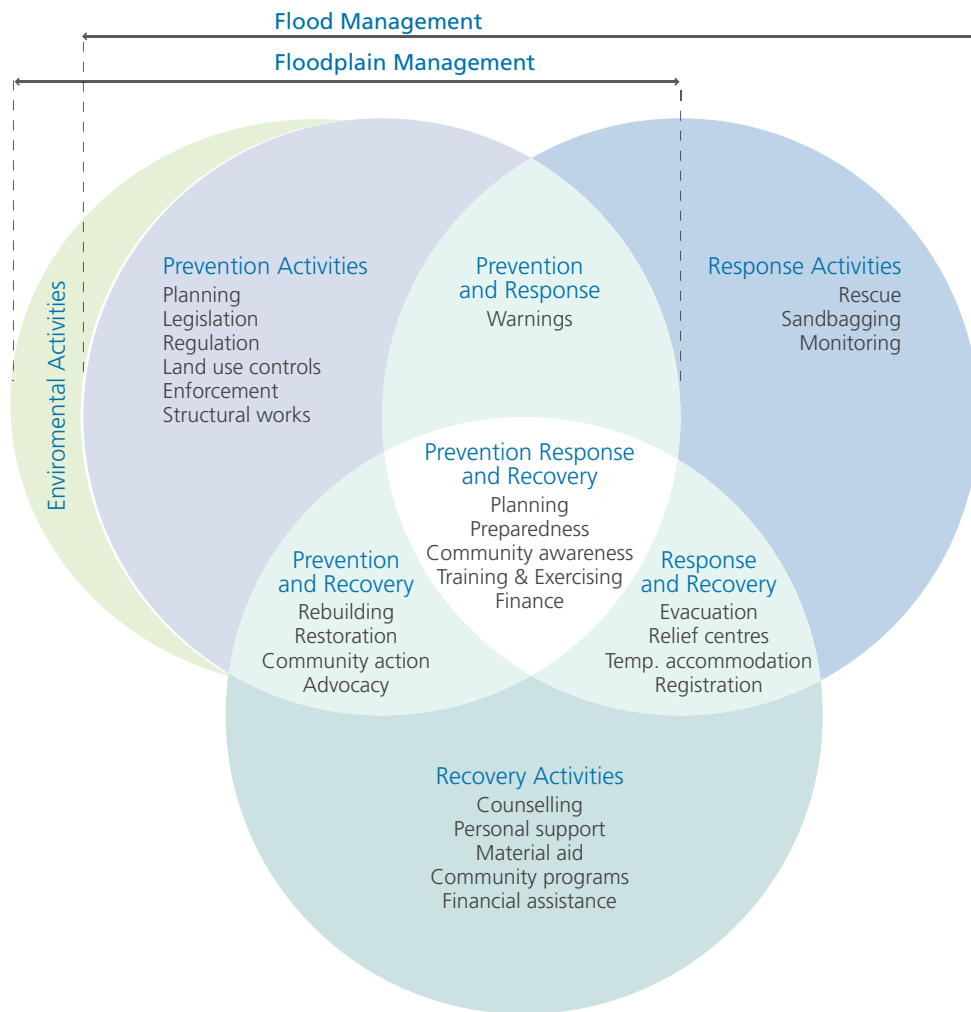
However, the responsibility for issuing flood related warnings clearly remains with the BoM and VICSES. Under the current institutional arrangements, the BoM is the organisation charged with the primary responsibility for weather forecasting and flood prediction except within the Port Phillip and Westernport area where the responsibility for flood prediction rests with Melbourne Water. The BoM constructs flood warning messages for selected streams throughout Victoria with the exception of those streams within the area delegated to Melbourne Water. The nature of these predictions or warnings depends on the quality of the information available to the BoM or Melbourne Water, including data from rainfall and stream gauges owned by others (water corporations, local government, DSE) throughout Victoria.

In Victoria, two statewide flood committees operate to ensure integration of all levels of government to deliver on flood management objectives, including establishment, evaluation, and maintenance of flood warning systems.

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18 Molino Stewart Pty Ltd, *Examination of the Total Flood Warning System in Victoria*, 2011 Victorian Floods Review, September 2011

Figure 3<sup>19</sup> – Prevention, response and recovery for emergencies



The State Flood Policy Committee (SFPC) provides advice on flood policy to government. It is chaired by DSE and reports directly to the VEMC. Membership includes representatives from DSE, OESC, VICSES, BoM, VicPol, Municipal Association of Victoria, DHS, DPCD, Melbourne Water, Victorian Rural Water Corporations and CMAs.

The SFPC has the following terms of reference:

- to oversee the development and implementation of the State Flood Management Strategy
- to undertake an annual review of the progress of the State Flood Management Strategy
- to provide high level liaison and coordination of flood management in Victoria
- to act as a clearing house for issues between authorities
- to nominate experts to the state assessment panel for the Natural Disaster Resilience Program
- to report annually to the VEMC.

19 Adapted from State of Victoria, Emergency Management Manual Victoria, 2011, Figure 1.1, p 1-6

The primary role of the Victorian Flood Warning Consultative Committee (VFWCC), established in 1988, is to identify requirements and to coordinate the development and operation of flood warning services in Victoria. It is convened by the BoM and includes representatives from the BoM, OESC, Victorian Rural Water Corporations, VICSES, local government, Melbourne Water, CMAs, and DSE. The VFWCC identifies and advises of priorities for upgrading existing flood warning systems and the introduction of new systems.

The VFWCC has the following terms of reference:

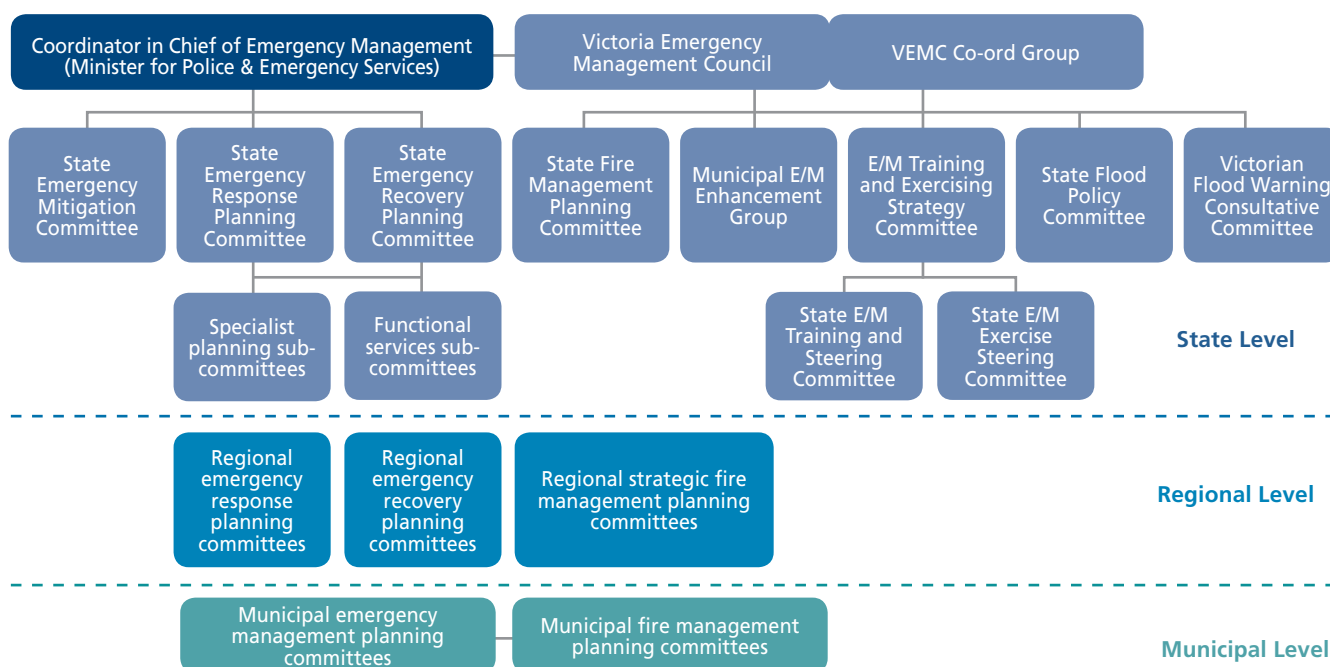
- identify requirements for new and upgraded flood warning systems
- establish the priorities for the requirements that have been identified
- coordinate the development of a flood warning system plan to meet the requirements and submit the plan to the BoM and participating government agencies for consideration and approval within budgetary and other constraints

- coordinate the implementation of flood warning systems in accordance with the approved plan and promote effective means of communication of flood warning information to the affected communities
- monitor and review the performance of flood warning services.

These committees are advisory in nature and report directly to the VEMC, which is described as the peak emergency advisory body to support the Minister and to advise on all matters, including the coordination of activities of government and non-government agencies relating to the prevention of, response to and recovery from emergencies.<sup>20</sup> While there is no specific term of reference, given the role of the VEMC in ensuring comprehensive and integrated emergency management arrangements are provided in Victoria, it is expected that this would extend to flood warning systems.

The relationship between the SFPC, the VFWCC and the VEMC is provided in the EMMV (see figure 4), which sets out the roles and responsibilities of agencies involved in the management of emergencies within the state, including the flood warning network.

Figure 4<sup>21</sup> – Emergency management planning arrangements



<sup>20</sup> Emergency Management Act 1986, s. 8 (1)

<sup>21</sup> Sourced from State of Victoria, Emergency Management Manual Victoria, 2011, Figure 5.1, p 5-2

The link to the SFPC and the VFWCC is generally informal although membership of both the committees are similar.

### Clarity of roles and responsibilities

Submissions to the VFR highlighted the confusion surrounding responsibilities for the flood warning network for a river, river reach or local community. Surprisingly, confusion is not confined to individuals but also across agencies. The delineation of the services required to be provided by the BoM and state and local government remain unclear. As noted by the Buloke Shire, a non-fragmented state policy on measuring systems (the rainfall and river monitoring and data collection networks that underpin flood prediction and response activities) would be useful.

The VFR has also found an apparent lack of awareness by some councils on their lead role in flood warning (including flash flooding).

The VFR is of the opinion that clarification is required regarding organisational responsibility for assessing strategic overview of all flooding, including flood risk. This inappropriately falls too often to local government where the resources and necessary skills are generally not available and as flooding issues and associated risks often cross multiple municipalities.

There have been several attempts over the past 13 years to clarify the governance arrangements for the flood warning network.

The VFMS did not attempt to specify or mandate levels of flood management for each community across Victoria. Rather it outlined the processes, including cost sharing arrangements, that would be used to enable regional communities to assess their flood risk and implement measures, whether they would be warning systems, land use planning controls or physical works (such as levees or as seen more recently voluntary land purchase), to meet the requirements for that region. The clear philosophy was that, with appropriate information provided to them, regional communities are best placed to make decisions on activities to deal with flood risks.

The NSDR<sup>22</sup> supports this approach proposing that individuals and communities be more self-reliant and prepared to take responsibility for the risks they live with. Importantly, communities need to be aware of the hazards and consider their needs in the development of plans and programs to deal with risks.

The VFR supports the philosophy of community involvement in flood management that results in flood management being tailored to local risks. However, as discussed below, the VFR is of the opinion that the governance framework established to ensure implementation is less than adequate across all levels of government in Victoria.

The process to identify the statewide requirements and priorities for a TFWS for Victoria over the past decade has been driven by two documents. The first document, *Arrangements for flood warning services in Victoria*<sup>23</sup> provides the background, principles and policies for flood warning services in Victoria.

The second document, *Flood warning service development plan for Victoria – Review of Flood Warning System Development Priorities within Victoria*<sup>24</sup> provided a comprehensive review of the TFWS. The most critical flood warning priorities were identified as statewide attention and improvements to flood awareness and preparedness, forecast interpretation and information dissemination and communication. The report goes on to say that:

*...gaining clarity on responsibilities for delivering on issues of community flood awareness and on the (local) interpretation of forecast flood heights into areas/assets at risk of inundation is an essential step to improving flood warning services and to protecting the current investment in those services.*

A more accurate or timely flood prediction or warning for a location is of little value if it is not disseminated to those who need it and is not understood or does not prompt an appropriate response. The lack of clarity on roles and responsibilities in relation to each of the TFWS elements or building blocks also contributes to this failure. In many cases the 'fix' has been seen as a boost to the technical elements of the TFWS through an injection of funding rather than a sustained and ongoing commitment to resourcing aimed at improving how available information is used to achieve a reduction in flood related damages. Without a clear mandate on these aspects of the TFWS, involved organisations are not in a position to deliver a coherent business case to support a funding bid. The TFWS is once again primed to fail.

22 Council of Australian Governments, *National Strategy for Disaster Resilience*, National Emergency Management Council, February 2011

23 Victorian Flood Warning Consultative Committee, *Arrangements for Flood Warning Services in Victoria*, 2001

24 Victorian Flood Warning Consultative Committee, *Flood warning service development plan for Victoria – Review of Flood Warning System Development Priorities within Victoria*, 2005

However, it is clearly unsatisfactory where the impediments to establishing and maintaining an adequate flood warning system are more a consequence of a lack of clarity of roles and responsibilities resulting in a lack of acceptance or accountability in providing such a service from those responsible.

The adequacy of flood prediction and warning systems, including roles and responsibilities, have been assessed and systemic issues identified in numerous reviews over the past five to six years. A review of the role of VICSES in flood warning, concluded that:

- there is variable commitment to ongoing funding with many councils refusing to contribute to flood data system maintenance
- data collection during an event is not always reliable. This may be due to old hardware, floods damaging gauges, weak telemetry systems or councils being unable to provide 24 hour service for their own flash flood warning systems
- council flash flood warning systems may be unreliable due to hardware or staffing issues.<sup>25</sup>

The 1998 VFMS was due to be updated in 2008–09. The VFR was advised that it has been delayed, however, due to the need to collect and consolidate information on several emergency issues including climate change pressures and variability, sea level rise, and lessons learnt from the VBRC on emergency response. As the VFMS is not an operational document, it had a minimal direct influence on emergency response for the flood events. The VFR is of the view that the lack of clarity on responsibility for flood warning systems and flood mitigation infrastructure resulted in less than adequate arrangements during the floods.

Presently VICSES has limited involvement and provides minimal direction into the establishment of flood warning networks. VICSES do not have a legislated role or funding to oversee or drive improvements in the network. Rather, as a participant on the SFPC and VFWCC, they provide advice. VICSES previously offered to take a lead role in the flood warning system. This offer was not supported by the government.

The VFR believes the broader landscape for flood warnings has significantly altered since the roles and responsibilities were agreed in 2001. In particular, the VFWCC noted in its 2005 report that although the relevant Minister at both state and federal level endorsed the arrangements, it is not clear that

the responsibilities were assigned to local government with due regard for the longer term resources and skills required to satisfactorily undertake such a critical function. It is evident that this remains a major impediment to the establishment of adequate warning systems in many regions.

As discussed elsewhere, flood predictions are prepared nationally by the BoM except those for the Port Phillip and Westernport area which are prepared by Melbourne Water. The VFR considers that this unique separation of functions requires revisiting. The benefits of the BoM becoming the sole organisation responsible for forecasting and predictions include being a single contact point for emergency services or communities, and reducing the duplication of communication. Melbourne Water maintains an end-to-end program of flood management being responsible for flood planning, mitigation (together with councils), flood mapping, gauging and predictions.

It is critical that any proposal to transfer responsibility for forecasting and predictions from Melbourne Water to the BoM should be based on an improved level of service to communities. Consideration should also be given to the capacity for the BoM to take on this additional responsibility, as it is already experiencing resourcing pressures in meeting its current obligations.

The MAV, together with councils, has raised concerns about the role of local government more broadly in emergency management and is currently undertaking a project aimed at establishing a policy position on local government's emergency management role. The MAV project is further discussed in Chapter Six. Any alteration to the local government role is likely to have implications for other organisations and therefore consideration by government of the outcomes of the MAV project should include an assessment of the capacity and capability of other organisations.

By way of example, a reduction in the role for local government in flood warning may require an increased effort by other organisations including BoM, DSE, the control agency and CMAs. If local government continues with their current level of responsibility, input from the appropriate CMA or Melbourne Water, BoM and from the control agency must be forthcoming as these organisations have specialist skills and knowledge that will inform and enhance delivery on flood warning matters.

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25 Molino Stewart Pty Ltd, *Review of SES Role in Flood Warning*, Victoria State Emergency Service, 2007



## Improving the total flood warning system in Victoria

In 2007, the recommendations for improvements from the two VFWCC documents were aggregated into the Flood Warning System Implementation Plan. The ten project themes, with the nominated lead agency (in brackets) are as follows:

- flood awareness roles and responsibilities (VICSES)
- flood planning at municipal level (OESC)
- linking flood studies to improved warnings (DSE)
- flood prediction – service level agreements (BoM)
- flood prediction – best practice in delivery (BoM)
- sustainability of flood warning systems (VICSES)
- coastal/estuarine flood prediction capability (BoM)
- post flood data management (DSE)
- flash flood prediction capability (BoM)
- VFWCC – follow up actions (BoM)

The VFR is aware that while some improvements have become embedded into standard practices, few of the above projects, fundamental to an improved flood warning system, have been significantly progressed, with the lack of progress attributed in part to the focus on ongoing drought.

In addition, there were a number of regions that were flooded during the 2010–11 floods that were not considered by the VFWCC as a priority for improvement to the flood warning system, most noticeably is south west Victoria.

The VFR is of the view that the current arrangements for the establishment, evaluation and maintenance of flood warning systems in Victoria, which includes the services provided by the BoM and Melbourne Water, require revisiting. The VFR has reviewed the recommendations from the Flood Warning Service Development Plan 2005 and progress update provided by the VFWCC.<sup>26</sup> The VFR considers that the recommendations in this plan remain largely valid, although the priorities for improved flood warning services need to be revisited in light of the 2010–11 floods. However, as discussed above, clarity of roles and responsibilities in flood warning needs to be resolved to ensure accountability is established for the implementation of the recommendations.

The BoM has sought to enhance its ability to meet future and increasing community needs for weather, water and climate services and information. Remedies include national implementation of the Next Generation Forecast and Warning System. This system was designed to provide a comprehensive state-of-the-art weather forecast service for both city and rural communities, with more detailed forecasts available for many more locations across Australia than currently was the case.<sup>27</sup>

The system, which was implemented in Victoria on 28 October 2008, is used to populate a digital database of weather and to provide graphical forecasts on a statewide basis through the forecast explorer tool for Victoria, New South Wales and the Australian Capital Territory. This digital forecast database has also been made available to emergency services, with fire agencies in particular utilising this information.

The VFR acknowledges the investment by the BoM in improving the flood warning system in Victoria as part of its statutory obligations. The BoM has provided \$80 million over five years to boost water monitoring networks throughout Australia through the Modernisation and Extension of Hydrologic Monitoring Systems Program. The objective of the program is to assist water information collectors to modernise and extend their water monitoring systems. The program ceases in 2011–12 and there are no immediate plans for extension. The funding guidelines outline six project themes that will be considered for funding and include for river discharge sites that are critical for seven to ten day and seasonal stream flow predictions and/or river level sites that are critical for flood warning purposes, where these sites also serve other critical water resource monitoring and prediction purposes.

The fragmented coverage of flood warning systems can also be attributed to provision of funding and the arrangements for the ongoing costs.

The VFR has been advised that the funding offered through the Commonwealth Government's Natural Disaster Resilience Grants Scheme (NDRGS) remains insufficient to ensure adequate improvements are made to the flood warning network, despite flood warning systems being funded more generously than mitigation projects. In addition, while no local contribution is required for the capital and installation component of the improved system, provided that the local agency (usually the local council) undertakes to fund the ongoing maintenance of the data collection equipment, some councils have not been willing to make that commitment, resulting in an under investment in warning systems.<sup>28</sup> Without continued and adequate attention to check the review processes in place, and

26 VFWCC submission to VFR October 2011

27 Bureau of Meteorology, *Annual Report 2008-9*, available at <http://www.bom.gov.au/inside/eiab/reports/ar08-09/index.shtml>

28 OESC letter to VFR, 27 May 2011

without attention to the development or strengthening of other elements of the TFWS, the gains made during and immediately after major flood events through provision of initiative funding soon begin to erode.<sup>29</sup>

The inability or unwillingness for some local governments to contribute financially to improved flood warning services has been recognised for over 10 years.

Investment in flood warning systems should be consistent with the needs identified at a state, regional and local level. In the past, this linkage has not always been apparent. This is evidenced in the funding guidelines referred to above, which indicate that preference is given to applications for multi-purpose monitoring sites instead of criticality of flood warning.

### Audit of flood warning systems

There are currently no audit processes with sufficient rigour to identify statewide gaps in flood risk assessments, flood studies, mapping or warning systems or for identifying where linkages and processes are not working as intended. For example, in actioning recommendations for new or improved flood warning systems arising from flood and related studies. Further, the VFR has found that despite the *Flood warning service development plan for Victoria* of 2005, being endorsed by the VEMC, there has been no audit undertaken on its implementation. The VFR has also found that there is no specific process to ensure local government are meeting their current flood warning commitments.

The VFWCC is required to monitor and review the performance of flood warning services.<sup>30</sup> As the VFWCC is advisory in nature, it is not responsible for the implementation of any recommendations arising from reviews or flood studies.

Further, the VFWCC's 2001 report, while recognising the need for periodic review of the flood warning system, particularly after a flood event, does not specifically list responsibilities for conducting a review. For example, the report lists the VFWCC as generally responsible for undertaking reviews and states that typically each organisation involved in flood warning (especially local government) would attempt some level of review. In view of the multi-agency nature of the TFWS, independent, uncoordinated reviews undertaken in an environment where there is a lack of clarity and gaps in roles and responsibilities, are doomed to deliver less than optimal outcomes.

The OESC, while having certain statutory responsibilities related to the setting of standards for the prevention and management of emergencies, does not have the responsibility to set standards, audit or assess the adequacy of the various elements of flood warning systems.

This situation demonstrates that despite the EMMV (Part 7 in particular) and other attempts to define roles and responsibilities, Victoria's flood warning network depends strongly on goodwill and cooperation between organisations. There is no single body responsible for overseeing the performance, maintenance or upgrade requirements of the network. Instead, such activities at best are loosely spread across local, state and commonwealth governments, CMAs and VICSES, each of which do not necessarily consider these functions as their core business.

### Tailoring flood warning systems to meet community needs

The VFR has found evidence that a number of communities, through local government or CMAs, sought funding from commonwealth and state governments to improve flood warning services within the region as a valid flood mitigation measure in response to a known risk.<sup>31</sup> The VFR also understands that over the past 10 years a number of funding applications for improved flood warning systems have been unsuccessful. Further, there have been instances where funding has not proceeded as beneficiaries (local government) have refused, for a variety of reasons, to take on the operation and maintenance costs of the data collection equipment.

Notwithstanding an apparent capacity to pay issue for some communities, it is the VFR's view that communities need to ensure the TFWS is tailored to meet their needs. This requires involvement in the design of the TFWS.

As discussed earlier, one of the key principles in establishing and delivering flood warning services is community participation in decisions relating to levels of service. However, the VFR has found that community involvement in the specification of an area's flood warning needs or in its implementation differs greatly across the state. While projects implemented through the mid 1990s and early 2000s to improve flood warning systems for Benalla, Euroa, Shepparton-Mooroopna and Traralgon and in the Ovens and King, mid-Goulburn and Barwon catchments did engage with the communities, the focus was generally (with some exceptions) on information exchange rather than on tailoring the system to meet the needs of those at risk

29 Goulburn-Broken Catchment Management Authority. Goulburn Broken Regional Floodplain Management Strategy, 2002, p 74

30 Victorian Flood Warning Consultative Committee, *Arrangements for Flood Warning Services in Victoria*, 2001

31 Corangamite Shire submission to VFR, May 2011. Glenelg-Hopkins CMA submission to VFR, May 2011

from flooding. The VFR has also determined that there is no functional linkage between flood risk and the associated need for a flood warning network and service delivery. The feedback loop between need and service delivery, including in terms of what is delivered (i.e. forecast locations, information provided, forecast lead time) either does not exist or is severely dysfunctional. To some extent, this is seen as a consequence of a weak connection between flood studies and what they deliver and flood response planning.

Where flood warning systems provide a higher level of service (Shepparton, Benalla), it is apparent that system development has been driven locally, based on a recognition and acceptance of flood risk across the various authorities and communities with agreement reached on the responsibilities for flood warning system development and implementation. Unfortunately, the VFR has found that the standard of arrangements such as those in Shepparton and Benalla, are not in place for many other communities at risk from flooding.

The VFR found that, in general, flood warning systems were more highly developed for those communities subjected to regular flooding. It is understandable that where flooding has not been an issue or as severe, the establishment of a flood warning system has not been a priority.

The priorities attached to the provision of flood forecasting services appear to rest solely with the BoM. How priorities are determined, whether in terms of expanding the BoM's capability to provide a forecast for an additional location or during a flood event is not clear to the VFR. Further, the rationale for providing existing prediction services and the content and scope of information provided in messages is similarly unclear. The connection between 'need' and 'delivery' on flood forecasts appears to be tenuous. Indeed, enquiries by the VFR suggest that a connection does not exist.

The VFR is aware of the intention by the BoM to create a Service Level Agreement (SLA) between the commonwealth and state governments. The BoM propose that SLAs be developed for all critical forecast locations. SLAs should include as a minimum:

- accurate definition of flood class levels (minor, moderate, major)
- minimum warning times required
- required frequency of warning updates
- required flood warning message content
- dissemination arrangements
- warning lead time and accuracy constraints.

The SLA defined for each location will form a critical input in defining required capacities within flood prediction agencies (Melbourne Water for the Port Phillip and Westernport area and the BoM elsewhere in Victoria) to deliver the required level of service. Although it was proposed that all SLAs be completed by the end of 2009, there is only one (Shepparton) in place. Consequently, there is no formalised statement of the level of flood prediction and warning service provided in specific basins.

In addition to service level standards, consistent performance assessment criteria need to be developed to determine the effectiveness of flood predictions for specific locations. This data would in turn be used to determine the cost effectiveness of improved flood warning services and where prediction agencies resources need to be targeted.

It was also proposed that the BoM and Melbourne Water develop agreed common flood prediction performance criteria by the end of 2008. Annual and post significant event performance reviews would then be completed by the BoM and Melbourne Water based on these key performance indicators for distribution to other flood management agencies based on the derived performance criteria. The BoM has advised the VFR that this is now expected to be in place by the end of 2011.

Under the EM Act, a municipal emergency planning committee must prepare a MEMP. The preparation of a flood sub-plan, however, is not a mandatory part of the MEMP even where there is a credible risk of floods. The VFR heard that the identification of community essential infrastructure at risk of flooding such as schools, roads and power transfer stations, prior to an event would allow a higher degree of consequence assessment prior to and during a flooding event. The VFR has found that many municipalities do not have flood sub-plans. Further, the VFR understands that even fewer flood sub-plans contain the flood intelligence that is vital to an effective response. The councils in the Wimmera region are notable exceptions.

The VFR considers the lack of a champion for the TFWS on a regional basis has resulted in enhancements being undertaken on an opportunistic basis depending on available funding and which organisation was successful in attracting or providing funding. This piecemeal approach has resulted in a TFWS for an entire river system or basin being a sum of individual components, often of mixed standards and with notable blind spots in the warning network. The VFR further considers that a strategic approach for developing a TFWS is required where the prediction and warning needs across an entire river system or basin covering both upland and lowland communities are considered simultaneously within the one plan.

## Bureau of Meteorology response to the flooding

The VFR is aware of an internal review initiated by the BoM to address, among other matters, issues arising from the Queensland Floods Commission of Inquiry. The review scope is provided in Appendix 4. The review is to report to the Commonwealth Government at the end of November 2011. The VFR also notes the Commonwealth Government's response to the matters raised in the Queensland Floods Commission of Inquiry *Interim Report* in relation to the performance of the flood warning systems.<sup>32</sup>

Due to the timing of the internal review being undertaken by the BoM, the VFR cannot comment directly on the findings. However, several issues in relation to the Commonwealth's response and the subsequent internal review are worth discussing.

Perhaps the most significant area of concern is the Commonwealth response to the Queensland Interim Report. There is a strong indication from the Commonwealth Government that while it supports the recommendations for improvement to its performance in relation to flood management including warnings, it would only do so within its existing level of resources.<sup>33</sup> A similar direction has been provided for the internal review, which seeks to improve the BoM's service provision to communities to meet current and expected future demands by investigating opportunities to reinvest or reprioritise existing resources, without compromising the ability to deliver on all BoM's responsibilities.

On 2 May 2011, the Victorian Minister for Water announced a \$19.3 million funding package over four years to improve Victoria's capacity to prepare for floods, which include components to undertake flood risk assessments, flood mapping and improvements to the gauging network for up to 25 communities. In addition, funding has also been provided to VICSES to ensure education programs are extended to communities at risk of flooding. VICSES has developed an implementation program for flood education. The VFR acknowledges the investment committed by the Victorian Government to enhance flood knowledge, however this state level investment does not necessarily translate into improved flood warning systems. It is important that the state seek a commitment from the BoM to ensure that new gauges once installed are utilised to increase BoM's flood prediction capability and coverage.

### Recommendation 1:

The VFR recommends that:

the state take the necessary measures to clarify roles, responsibilities and cost-sharing arrangements for flood warning systems, including tasking state and regional bodies to be responsible for the flood warning system. This will require engaging with the commonwealth to amend the 2001 arrangements, updating the 1998 floodplain management strategy accordingly and continuing to support commonwealth initiatives designed to improve flood mapping standards and associated issues.

### Recommendation 2:

The VFR recommends that:

the state task the Emergency Services Commissioner with the responsibility to establish an effective audit regime of the total flood warning system.

### Recommendation 3:

The VFR recommends that:

the state develop a flood warning system for each basin and location with community input and make relevant documents publicly available. Each warning system should include key performance indicators.

### Recommendation 4:

The VFR recommends that:

the state and commonwealth undertake a review into the appropriate institutional arrangements for the forecasting and predictions function currently undertaken by Melbourne Water for the Port Phillip and Westernport region.

32 Commonwealth Government response to the Interim Report of the Queensland Floods Commission of Inquiry September 2011

33 Commonwealth response to the Interim Report of the Queensland Floods Commission of Inquiry, September 2011

## Flash flood warning systems

There are a number of differing views on what constitutes flash flooding; from temporary exceedance of urban stormwater drainage system capacity through to large and very rapid rises in both rural and urban streams, sometimes as a result of urban stormwater being discharged to the stream. The trigger for flooding is considered to be essentially the same – high intensity short duration rainfall emanating from thunderstorms or severe rainfall events.

Flash flooding in Australia is defined as flooding that occurs within six hours of the start of the rain that causes it.<sup>34</sup>

The BoM does not provide warnings for flash flooding for specific creeks and locations (ie. where the catchment response, the time between rainfall and flooding, is less than six hours). Rather, it provides generalised warnings of weather conditions likely to lead to flash flooding. While the task of issuing warnings of weather conditions likely to lead to flash flooding is a BoM responsibility, the task of issuing catchment or location specific flash flood warnings to the at risk community, the media or other entities is a local government responsibility.<sup>35</sup>

It has been suggested that the rationale for differentiating responsibility for, and delivery of flash flood and non-flash flood warning services, relates mainly to the need to maximise the limited forecast and warning lead time available. There is a need for rapid response at a local level.

The distinction between warning of the occurrence of weather conditions likely to lead to flash flooding and providing a flash flood warning service is subtle but significant.

The forecasting of flash flooding is not a trivial task. Such flooding is often associated with severe thunderstorms or small scale weather systems that are locally intense and slow moving. The BoM can forecast the environment in which these types of weather events may occur and provides a generalised service to that effect. However, the VFR understands that it is not yet scientifically possible to predict individual flash flooding events, except on time scales of ten minute multiples at the very best.

The BoM's policy on the provision of flash flood warning services is enunciated in a document prepared in the mid-1990s. Following a definition of flash flooding (*flooding occurring within about six hours of rain, usually the result of intense local rain and characterised by rapid rises in water levels*), the document describes the policy framework, which underpins the flash flood warning service provided by the BoM.<sup>36</sup>

The VFWCC<sup>37</sup> also refer to the provision of flash flood warning services and make it clear that the BoM does not have an exclusive role. Responsibility for the purchase, installation and maintenance of flash flood warning systems, including the development and operation of flood response plans, became a shared state and local government responsibility with technical assistance to be provided by the BoM.

Further, the VFR is of the view that the arrangements described by the VFWCC are not couched in TFWS terms and fail to address system elements that do not have a technical basis. A flood warning system (and investments in their implementation) that overemphasises the collection of input data and/or the production of forecasts relative to the attention given to other elements (such as message construction, the information provided in the messages and the education of flood prone communities about floods and flood warnings) will invariably fail to fully meet the needs of the at risk communities they have been set up to serve.

The BoM role is described in the 1996 *Policy on the Provision of the Flash Flood Warning Service* as primarily 'maintaining a central source of expertise and development capability and providing specialist advice on the establishment of locally based warning systems'. The policy document also indicates that the BoM accepts 'a continuing responsibility for the provision of real-time forecasting and monitoring of regional flash flood producing conditions'. The policy document further states that "...the objective of the flash flood warning service is to minimise the potential for loss of life and damage associated with such events by providing information to the public, emergency management organisations and other authorities of the timing and spatial distribution of flash flood situations".<sup>38</sup>

34 Bureau of Meteorology, *Bureau of Meteorology Policy on the Provision of the Flash Flood Warning Service*, May 1996

35 VFWCC, 2001: Arrangements for Flood Warning Services in Victoria. February 2001

36 BoM, Op. cit

37 VFWCC, Op. cit

38 Bureau of Meteorology, *Bureau of Meteorology Policy on the Provision of the Flash Flood Warning Service*, May 1996



The BoM's flash flood warning service is comprised of four components that depend on the sophistication of available monitoring and forecast capabilities as follows:

- generalised warnings (issued to the general public and emergency management organisations, generally as a regional severe weather warning) associated with the onset of heavy rainfall
- radar based warnings of rainfall (issued to identified agencies and user groups as a severe thunderstorm warning at a space scale, where feasible according to BoM, of a typical local government area) that could lead to flash flooding within specific areas, but only where those areas are covered by suitable weather watch radar and where a threshold intensity, chosen such that its exceedance will produce flash flooding irrespective of existing antecedent catchment conditions, is expected to be equalled or exceeded
- area specific predictions of rainfall intensities (issued to local flash flood warning groups where a local warning system has been established) but only in areas covered by suitable weather watch radar
- support and advice to local authorities in the establishment of automated flash flood warning systems (for example, ALERT systems) and related matters.

The principles applying to the provision of flash flood warning services are different from those applying for areas with longer response times. Essentially these principles can be summarised as:

- the BoM has a responsibility to provide predictions of weather conditions likely to lead to flash flooding
- local government has prime responsibility for flash flood warnings extending from system establishment and operation through to the provision of predictions of stream levels if required
- the BoM will provide specialist technical assistance and advice to local government to assist in system establishment and in relation to flood prediction techniques.

What this means is that any flood warning system established for a stream or location considered to be subject to flash flooding will need to be paid for and managed by the local council but that the BoM will provide advice aimed at assisting the council establish and develop the technical aspects of the system. Operational responsibility, and thus message construction and dissemination, will also reside with the council. The BoM will, however, assist through the supply of operational software for data management and alerting and continue delivery of existing severe weather and flood warning related services. While it is not specifically stated where responsibilities for other elements of the TFWS reside, it is assumed that arrangements in place for non-flash flood warning systems apply.

In the Greater Melbourne region where flash flooding can occur across a number of local government boundaries, the 2001 VFWCC flood warning arrangements indicate that Melbourne Water can provide assistance, where appropriate and possible.

VICSES and Melbourne Water have initiated a program of community education and awareness for flash flooding. In regional Victoria, the VICSES program focuses largely on non-flash flooding. The VFR is of the opinion that due to the relatively short warning lead times for flash floods, it is critical that people are aware of the potential consequences prior to the event. It is therefore important that VICSES and councils adopt an education and awareness program for flash flooding in regional towns with a history of flash flooding.

Funding has been available through the Natural Disaster Resilience Grants Scheme (NDRGS) to establish local flash flood warning systems. While council's initial contribution can range from zero to 33 per cent of capital cost, councils are required as part of the funding agreements to maintain infrastructure including gauges and monitoring equipment. The VFR heard that councils do not necessarily have the expertise or capability to develop and operate such systems and have been reluctant to take on the ongoing costs associated with maintaining the data collection and warning system. The consequence is despite responsibilities for flash flood warning arrangements being in place for over 15 years, there are few places in Victoria with such systems. The VFR is aware that the City of Greater Geelong has established flash flood warning systems for the Moolap community within Geelong and also for the township of Lara. The system is fully funded and operated by the council and has regard for all elements of the TFWS.

Similar to non-flash flooding, unofficial warnings, including self-warning as a result of personal observation of environmental indicators and cues, or localised sharing of information within communities of danger signs, are an important source of warning for flash floods. However, regardless of the source of prediction (official or unofficial) practical information on what to do in response to flash flooding is critical.<sup>39</sup> Anecdotal evidence suggests that the community response in Newcastle (NSW) to the 2007 flash flood warnings issued by the BoM had little impact on the public's preparedness and response to that event.<sup>40</sup> This is not surprising given that (flash) flood warning systems are, by their very nature, complex. They are a combination of technical, organisational and social arrangements. As Handmer points out "flood warnings often don't work well and too frequently fail completely – and this despite great effort by the responsible authorities".<sup>41</sup> All too often, too little attention has been paid to issues of risk communication. In particular:

- to building a local awareness of flood risk along with knowledge of what can be done to minimise that risk
- determining what information is required by the at risk community and with what lead times
- how warnings and required information will be distributed to and within the at risk communities
- ensuring that recipients of warning messages understand what the message is telling them and what it means for their property and individual circumstances in terms of the damage reducing actions they need to take.

It was suggested to the VFR that there is scope to improve the flash flood warning services within Victoria by extending the provision of quantitative flood warning services to catchments in which flooding may occur within three hours of heavy rainfall. The VFR is aware of such trials in New South Wales where the BoM, in partnership with local government, also issues quantitative flash flood warnings for a limited number of sites.

There was one clear example in January 2011 where an agency took considered measures to prepare for potential flash flooding based on BoM weather information and warnings of possible flash flooding. (See the following case study on the Grampians National Park.)

The establishment of a flash flood warning system is more to do with the susceptibility of an area rather than predictions. Consequently, towns in upper catchments with a significant gradient, highly urbanised areas around waterways and metropolitan Melbourne, are more susceptible to the threat to life and property arising from flash flooding. The use of the BoM's severe weather forecast services by farming communities is extensive with such warnings fundamental to maintaining farming businesses.

The VFR is of the opinion that there are five core issues in relation to current arrangements underpinning flash flood warning systems:

- the lack of definitive state policy and direction on roles and responsibilities – the role of the BoM and of other TFWS stakeholders in the delivery of forecasts and warnings of conditions likely to lead to and of actual flash flood events is not as clear as it needs to be
- local government's ability, in terms of both financial and technical capacity, to establish, maintain and operate an effective flash flood warning system with regard for both technical and social aspects (all TFWS elements); unless there is active participation from local government, the framework breaks down
- a key tool in extending the warning lead time available in flash flood catchments is weather radar and timely local (community and agency) access to (as a minimum) raw information on the likelihood of rainfall likely to lead to flash flooding
- awareness within the at risk community that flash flooding is a credible risk and the circumstances that may give rise to an event
- dissemination of meaningful and timely pre-scripted warning messages (that impart essential information in a way that is understandable and elicits appropriate responses) to those at risk from flash flooding.

39 Environment Agency, *Understanding of and response to flash flooding*, June 2009

40 McKay G, Bureau of Meteorology NSW, *Guidelines for Local Flash Flood Warning System Proposals*. 48th Floodplain Management Authorities of NSW Conference, Wollongong, 26-29 February 2008

41 Handmer, J.W. 'Are Flood Warnings Futile? Risk Communication in Emergencies'. *The Australasian Journal of Disaster and Trauma Studies*. Volume: 2000–2

### Case study – Responding to weather warnings in the Grampians National Park<sup>42</sup>

On Tuesday 11 January 2011, 135mm of rain fell within a 24 hour period causing minor flooding across the Grampians National Park. This single rain event was the highest single day event recorded within the rainfall history of Halls Gap. On the following day, Parks Victoria staff undertook a park wide assessment of damage and also informed visitors at key sites of deteriorating road conditions.

Throughout Wednesday, reports from the BoM warned of impending high rainfall totals over the 24 hours commencing midnight. Reports from staff out on patrol also reinforced the impact that the rainfall to date had had on the park with roads and walking tracks severely damaged and eroded. Only 10mm of rain fell throughout the day on 12 January.

On the morning of 13 January 2011, confirmation was received at 7:30am that the Grampians Region would receive high rainfall totals again. With this prediction and knowledge that conditions in the park were already slippery and dangerous, staff were deployed to all visitor nodes, in particular camp grounds to advise visitors of the following:

- that a major rainfall event was predicted by the BoM which would make the gravel road network very dangerous and increasingly difficult to navigate
- that due to the predicted conditions, Parks Victoria recommends moving out of the forested areas
- that if rainfall continues, creek crossings will become impassable making egress from the park difficult
- that early movement out of the park will ensure safe passage, particularly if the predicted rain eventuates

Staff were deployed at 8.30am and by 9.30am, rain was steadily falling across the park. By 11.30am all camp grounds had been checked and the limited number of visitors in the park were informed of the expected conditions and advised to move on.

The events that unfolded on Thursday afternoon included another 135mm of rainfall (in an already flooded environment), over 190 landslips, major flash flooding in Halls Gap, Wartook and the Victoria Valley and significant damage to critical infrastructure including roads, bridges and potable water assets. Despite these major incidents, there were no injuries reported on the day of the flooding and no park visitors trapped between landslips, flash flooding or damaged infrastructure. Much of this can be attributed to:

- the advice received from the BoM in the lead up to the event
- the responsiveness of staff to recognise the consequences of such rainfall predictions across the landscape
- the subsequent evacuations of camp grounds, day use areas and the dissemination of information, prior to the worst of the conditions hitting the Grampians region.

The VFR recognises the investment Melbourne Water has made to advance flash flood warning systems in selected locations. Melbourne Water is currently piloting a flash flood warning system in Brushy Creek and Blackburn South. The system uses existing monitoring sites and based on rainfall intensities or flows, sends text alert messages to a pilot group of residents. The system does not predict flooding but warns of significant rain in the area. Melbourne Water is currently evaluating the system.

#### Recommendation 5:

The VFR recommends that:

the state engage with the Bureau of Meteorology to establish a joint initiative to review existing flash flood warning systems in Victoria and identify where additional systems are needed, with a particular focus on urban centres with a history of flash flooding. This review should seek to achieve outcomes similar to those implemented in NSW. Subject to those outcomes being implemented, the state should determine which agency is responsible for flash flood warnings.

<sup>42</sup> Information provided to VFR by Parks Victoria October 2011

## Rain and river data

An essential basic input to the TFWS is rain and river data. Without at least some river data it becomes very difficult to predict future river levels (or flows). Without rainfall data, the lead time on flood predictions is reduced as the time between when the prediction is made and when the peak is expected to occur is less than if rainfall is taken into account. Further, in general it is very difficult to predict the onset of flooding or the exceedance of critical levels without rainfall data.

The location of rain and river gauges that support the TFWS is often a compromise with tradeoffs occurring based on primary use (or purpose), the availability of a communications path or infrastructure, land occupancy and access issues, the likelihood or susceptibility of the site to vandalism, available budget for capital and ongoing costs and related matters.

The rain and river gauges that support Victoria's flood predictions are mostly equipped with telemetry which enables the BoM (and others) to access data in real time or near real time. There are, however, a number of gauges that are still read manually. These require a person to read the rainfall amount or river level and report, usually by telephone, to the BoM or data site owner. The need for human input restricts the circumstances in which data can be obtained (daylight hours, while the gauge remains accessible) and foregoes the advantages offered by current technology which include automated timed and event reporting, alarms that can be adjusted for circumstances such as catchment conditions, multiple agency reporting and so on.

The availability of, and access to, up to date rainfall and river flow/level data is critical for flood forecasting in rapidly reacting river catchments. Without this data, the BoM is limited in its ability to fit and then utilise a rainfall runoff model for the catchment and limits its ability to provide timely and accurate flood predictions.

Not all rain and river sites are equipped with the same instrumentation. There is a range of equipment in use across the state that utilise a variety of data transfer (or delivery) mechanisms. The BoM has advised that it is their intention to seek to replace or upgrade manually read gauges to ensure real time information is available to assist flood forecasting. Their automation would also reduce the occupational health and safety issues associated with reading a gauge in wet and often dangerous conditions.

## Rain gauges

Rain gauges provide a measure of the depth (and sometimes intensity) of rain falling at a point.

In flood forecasting it is assumed that what is measured at a point is indicative of the rain falling over the area adjacent to the gauge. That assumption is rarely correct as rainfall varies considerably both spatially and temporally within a storm or rain event as rain does not fall uniformly over an area or over time. There is no guarantee that what is measured in the rain gauge is representative of what is falling across other parts of the catchment. For that reason, it is not necessarily correct that more rain gauges will automatically lead to an increase in the accuracy of flood forecasts.

Similarly, while predicted rainfall can provide an increase in the lead time available on the likely scale of flooding and while rainfall runoff models include schemes for using actual and forecast rainfall in a way that is sympathetic to landscape and other influences, there is a degree of uncertainty in all flood predictions.

The BoM maintains an extensive network of rain gauges across the state as part of the national network that supports its meteorological functions. Data from that network is available to inform and assist flood forecasting activities although data from many of the gauges is not available sufficiently frequently to materially assist flood predictions.

Other rain gauges have been co-located with stream gauges and while not ideally located from a hydrologic point of view, provide data at an attractive marginal cost. Other rain gauges have been installed specifically to support flood forecasting activities, mainly in headwater areas or other areas where data coverage is sparse. Final locations are often a compromise between accessibility, security and availability of telemetry to enable real time or near real time data reporting.

## Stream gauges and rating tables

Stream gauges measure the depth of water at a location within a watercourse or body of water. Flow is determined at the stream gauge location via a rating table (or curve). The rating table is developed over time by physically measuring the flow at various levels and then extrapolating it to higher levels using mathematical formulae. These rating tables are used within rainfall runoff models to convert predicted flows to predicted levels at key locations.

Rating tables are however subject to some obvious limitations. Large stream levels and flows only occur during large floods and are quite rare. This means that the flow at the upper end of a rating table may never have been measured. Further, as the flow at a level as a flood rises is not the same as when the flood is falling (the hysteresis or lag effect), the rating is at best an approximation of the flow. In addition, as the water level rises, it spills out of the stream channel and onto the floodplain where physical and other features influence flow rates. This adds further uncertainty to the rating table or the flow associated with a particular level. In turn, this adds varying degrees of uncertainty (or possible errors) into the flood prediction as the flood prediction model relies on the rating table. This uncertainty is not conveyed in the prediction.

## The Victorian stream gauging network

There are 585 stream gauges across Victoria used to support flood monitoring and prediction activities. Two hundred and thirty six of these sites are 'rated' (i.e. rating tables are available to enable conversion of stream heights into flows usually in megalitres per day (ML/d)). Most of the equipment installed at each of these stream gauge sites is owned by more than one agency, including the BoM, DSE, CMAs, local government and water authorities.

### Maintenance of rain and river gauges

The stream gauges (and any co-located rain gauges) along with many of the rain gauges installed specifically to support flood forecasting activities, are maintained (this includes fault fix and preventative maintenance, asset replacement as well as stream gauging activities aimed at maintaining rating tables) under one of four regional water monitoring partnerships. The partnerships were established to ensure statewide consistency in water resource data collection. DSE procures the surface water monitoring services on behalf of the partnerships. Individual partnership organisations, including water corporations, CMAs, and local and federal government agencies, stipulate their monitoring requirements and DSE oversees the implementation of the monitoring services through the surface water monitoring contracts.

Monitoring requirements vary depending on the organisation's business drivers with each partner paying their respective cost share at each monitoring site in order to meet their individual flood warning, natural resource management and water allocation management and reporting requirements. Agreed rules stipulate agency responsibilities with respect to the withdrawal of funding support from a site and the redistribution of ongoing costs to the other at site partners.

While there is no formal audit or performance evaluation for these contracts, surface water monitoring services are operated under a contract with rigorous evaluation and monitoring conditions.

Prior to the partnership arrangements, maintenance and monitoring services were contracted on an individual agency basis which resulted in cost and resource inefficiencies as well as data access and ownership issues at sites where multiple agencies had an interest in obtaining relevant data.

There remain some gauges that are not part of the regional water monitoring partnerships. There are a variety of reasons for this, the main one usually being that the gauges are agency or purpose specific. In these cases, it is up to the owner of the gauge to operate and maintain it either directly or under individual contract.

The capital costs of stream and rain gauges installed (or upgraded to telemetry) for flood warning purposes are generally now shared between the state and commonwealth subject to ongoing maintenance and asset replacement costs being borne by local government.

The VFR noted that despite these arrangements, the state government funded the repair of designated flood warning gauges damaged through the recent floods.

### Stream gauge performance during floods

Stream gauges provide critical information during a flood event. Importantly, real time information from gauges is used to assist in developing and verifying predictions generated through rainfall runoff models.

The VFR heard that there were a number of issues relating to the performance of the existing flood gauging network.

A significant proportion of the 585 stream gauges sustained damage during the floods. In regional Victoria, more than 132 gauging stations were damaged, and a further 20 flood gauges were damaged in the greater Melbourne region. Damage ranged from accumulation of debris that affected equipment operation through to destruction of the gauge installation.

It was reported to VFR that at least one gauge continued to transmit a constant water level as the flood continued to rise. The equipment at the site had been drowned out by the flood but it persisted in providing the last valid river level reading. Without an appreciation of local hydrology and river and site conditions, such behaviour might have led a person looking at the data to believe the flood had peaked earlier and lower than was the case.



The VFR is aware that some of the gauges in the Wimmera catchment, where an incorrect level was provided during the September and January floods, hampered understanding of flood behaviours. While the readings could be corrected manually, the process was time consuming. The VFR understands that most of these issues have now been resolved.<sup>43</sup>

Issues related to the performance of gauges were raised initially after the September floods in a VICSES *After Action Review* report. VICSES noted that while river gauges around the state provided useful information, the BoM was at times constrained by the state of river gauges.<sup>44</sup> It was reported that many river gauges were faulty, some needed interpretation and calibration before readings made any sense and there was no live feed of available river readings to incident managers.

The VICSES *After Action Review* report recommended that VICSES approach the BoM with a proposal to initiate a review of the Victorian stream gauging network with a view to its extension and modernisation. It was further recommended that gauge data from the BoM be made automatically available to ICCs.

Further technical issues include the delay between the data being accessed by the BoM and it appearing on their website. It is understood that data is not fed directly to the website but that the website is updated on a timed basis, currently believed to be every hour. While it is appreciated that data management can be complex and that the BoM handles a large volume of data, an hourly update of river and rainfall data can mask large changes on rapidly responding watercourses that could heavily influence local response. Further, the delay prevents up-to-date data being available to the ICC.

As outlined above, there are formal arrangements for response to and to restore and reinstate gauges damaged during floods. For example, Thiess, as the managing contractor for the Regional Water Monitoring Partnerships, were able to restore functionality to all damaged gauges used for flood warning within four days of the damage occurring.

The VFR heard that communities and authorities used substitutes during the floods to understand flood behaviour (in terms of scale, progress, trend) where gauges either were absent or failed, or where information was not provided through the emergency management arrangements. A range of techniques was used to provide this information, including:

- installation of temporary manually read measuring tapes/gauges at key locations and the tasking of personnel (either CMA or from the ICC) to read the level at each location at preset intervals. This is a technique used extensively by CMAs to gather data (particularly peak levels) in sensitive or

data sparse areas. This was done extensively around Swan Hill (Pental Island and Tyntynder Flats areas) and informed operational response as well as assisted in the firming up the timing of forecast flood peaks. This data is also of immense value in assisting the fitting of hydraulic models during flood studies and could be of some use in later floods

- using a point of reference on fixed infrastructure in order to assess the trend (rising, steady, falling) as well as the absolute change and speed of change. Commonly used infrastructure includes bridges and marker posts as well as fence posts and trees. Information arising from such observations tends to be qualitative and can be problematic when the observer changes, the flood rises past the fixed reference point or access is lost. One off readings are of little value. Readings provided from Benjeroop during the January 2011 flood were however very useful within the ICC as they were provided routinely and a history was established
- local personnel (either CMA or from the ICC) travelling between gauges at preset intervals to record current levels and trends. Frequency was driven by the speed of the flood. Current river levels were obtained around Horsham in this way in January 2011
- comparison of daily line scan and infrared satellite imagery. This approach is only useful in widespread and slow moving flood situations such as along the Wimmera, lower Loddon, lower Avoca and Murray rivers where the water spread is wide and the speed of travel is slow
- flood gaugings at gauge sites and other locations. This involved Thiess gauging the full cross-section of the flood at key locations while noting the trend (rising, steady, falling). Gaugings were undertaken at a number of locations across the lower Loddon and lower Avoca floodplains as well as in the Murray and some of the distributaries around Swan Hill in January and February 2011. This data provided confirmation of the location of respective peak flows and facilitated the firming up of downstream forecasts as well as the utilisation of resources and development of response and water management strategies (for example in the Lower Loddon and Avoca lakes, at Lake Boga and in relation to the levees on Pental Island and Tyntynder Flats)
- comparison against historic flood markers. Information on exceedance of (or proximity to) historic flood heights is usually reported by local residents, often farmers who refer to marks in trees or other suitable long term assets. While a one off report, they do confirm the scale of an event. The availability of more formal historic markers would assist this reporting while raising community awareness.

43 Wimmera Catchment Management Authority, *Draft Flood Report* June 2011

44 Victoria State Emergency Service, *VICSES After Action Review – Flood Emergency*, September 2010

Issues associated with funding the maintenance of gauges and the importance of gauges in a regional flood warning context were raised with the VFR on numerous occasions, including by the Wimmera CMA which stated:

*Ongoing funding for the maintenance of flood warning streamflow gauges has been an increasing challenge, yet they are indispensable during floods. A model for the ongoing provision and maintenance of the system needs to be carefully developed. It is apparent that the current council funded arrangement, which requires ongoing maintenance and operation costs to be borne by local government, has not been successful. Some councils ignoring their responsibilities in this area has a major impact upon the collective management of the catchment flood warning system, with the potential for 'data holes' to appear if other agencies do not go above and beyond their responsibility and fund additional flood warning sites than they were obliged to.<sup>45</sup>*

A number of gauges were severely damaged by the floods. While efforts are underway to fix them, it is important that they be improved to be better able to withstand future floods. They should also have redundancy measures in place to ensure they can provide invaluable data on stream flows. Wimmera CMA stated that more gauges will increase the accuracy of flood modelling and fill gaps where there is little knowledge about flood behaviour.

During the February 2011 flood event some 20 gauging sites used by Melbourne Water for flood warning and forecasting purposes suffered some form of damage.

Melbourne Water has a program to perform stream gauge checks, fault resolution and flood gauging during flood events. Melbourne Water advised that during the February 2011 flood event, a sensing instrument issue at one key site (Iona on Bunyip Main Drain) was identified, however, the fault was quickly rectified and the issue had no impact on the flood warning and forecasting activities.

### Terminology used to disseminate stream gauge readings

The VFR heard that terminology used to describe floods was confusing to communities and emergency service organisations. Through the multi-agency debrief sessions and community consultations, the VFR heard that floods were described in terms of local gauge height (in metres), Australian Height Datum (AHD), flow rate in megalitres per day (ML/d) and average recurrence interval (ARI). At Rochester, where there are two reference gauges (at the siphon and township) one gauge is reported in local gauge height and the other in AHD leading to some confusion in the community during the January 2011 floods.<sup>46</sup>

At present a combination of local datum and AHD is used for recording river heights and for flood classification (minor, moderate, major) at forecast locations as follows.<sup>47</sup>

- (a) Flood warning river level sites including forecast locations reporting in real time:
  - total: 278 sites
  - local datum used at 267 sites, 96 per cent
  - AHD datum used at 11 sites, 4 per cent
- (b) Flood forecast locations with minor, moderate and major flood class levels:
  - total: 150 sites
  - local datum used at 144 sites
  - AHD datum used at nine locations (three locations with local + AHD)
  - local datum and flow (ML/d) used at 10 locations (reservoirs or weirs)
  - flow in m<sup>3</sup>/s used at one site

Water level in AHD is the height of the water level above mean sea level. The correct definition is that AHD is the datum that sets mean sea level as zero elevation. Mean sea level was determined from observations recorded by 30 tide gauges around the coast of the Australian continent for the period 1966–68.

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<sup>45</sup> Wimmera CMA Submission to VFR, 26 May 2011

<sup>46</sup> Shire of Campaspe submission to VFR, 18 May 2011

<sup>47</sup> VFWCC Submission, October 2011

Relationship between AHD and local datum is given by the following equation:

$$\text{Water Level in AHD} = \text{Water Level in Local Datum} + \text{gauge zero in AHD}$$

For example,

$$163.2\text{m AHD} = 3.9\text{m (gauge reading)} + 159.3\text{m (AHD height at the bottom of the gauge)}$$

A significant number of water level sites in Victoria (approximately 96 per cent) record river levels to local datum. In addition, a significant number of forecast locations with minor, moderate and major levels (approximately 96 per cent) are set to local datum. Most gauges immediately downstream of reservoirs and weirs have flood class levels set to local datum as well as flow in ML/d.

The VFR heard that inconsistency in terminology leads to confusion and hinders responses, particularly where gauges are located in the same region or catchment and are used to inform communities of the same flood event. However, this is not a widespread issue as the majority of sites are recorded to local datum.

The VFR is of the view that altering the terminology (gauge datum) would do nothing to resolve the fact that many communities appeared to have limited understanding of what the gauge height would mean for them in terms of impact (for example depth or extent of flooding). It is equally, if not more important, that whatever the metric used to describe the flood, those receiving the message understand the implications or consequences. There is a need for robust flood awareness and education programs to ensure communities are capable of response.

The AHD and local gauge height is only applicable to the water level at close proximity to the gauge. It was suggested to the VFR that if gauges were transferred into AHD, it would be a simple process for an individual to understand their personal flood risk once they knew the height of their property (in AHD). However, it is not correct to assume the same height of water at a gauge and at a property some distance away due to the slope of the water and other factors such as constriction points in the landscape. This becomes more pronounced the further away from the gauge location. As a result, it is inappropriate to use water level in AHD and known AHD datum at a property to estimate flooding risk for the property. Rather, flood risk studies, involving detailed flood mapping is the best way for communities to understand the relationship between gauge height and the potential consequences for their properties. The VFR notes that the Queensland Floods Commission of Inquiry recommended in its *Interim Report* that individual properties or businesses be made aware of their flood risk.<sup>48</sup>

There are several examples, including Horsham, Benalla and Wangaratta, where councils together with VICSES and the catchment management authority have transferred information on flood height to understandable information within communities via information in individual property meter boxes or a public reference site (for example, markings on the Yogi Bear statue in Apex Park, Wangaratta).

#### Recommendation 6:

The VFR recommends that:

the state and the Bureau of Meteorology liaise to ensure the existence of appropriate quality control processes for gauges and contingency measures in the event that gauges are damaged during flood events.

#### Recommendation 7:

The VFR recommends that:

the state expand the Regional Water Monitoring Partnerships model to include all flood warning gauges.

#### Recommendation 8:

The VFR recommends that:

the state

- undertake a strategic review to identify areas at risk from flash or riverine flooding. Shortcomings in the flood gauging networks identified in the review should then be the focus of remedial action
- seek to address as a priority any notable gaps in the total flood warning system as apparent in the 2010–11 floods (including south west Victoria, Wimmera and north central region) by enhancing mapping, gauging and education programs; and
- seek a commitment from the Bureau of Meteorology to ensure any new gauges installed are utilised to enhance flood prediction capability and coverage.

48 Queensland Floods Commission of Inquiry, *Interim Report*, State of Queensland, August 2011, p 136

### Recommendation 9:

The VFR recommends that:

the state, in consultation with Bureau of Meteorology and Melbourne Water, take the necessary action to ensure that all flood warnings issued are linked to the geographical location of the gauge the data was derived from.

### Recommendation 10:

The VFR recommends that:

the Bureau of Meteorology should present water levels in both local datum and Australian Height Datum (gauge zero) for all its published information and warnings.

### Recommendation 11:

The VFR recommends that:

the state take the necessary measures to upgrade existing manual stream and rain gauges and ensure that all future gauges provide a seamless transfer of data from the gauges to the Bureau of Meteorology.

## Flood predictions

The BoM provides predictions of weather conditions likely to lead to flash flooding. Local government is primarily responsible for flash flood forecasting (if and as required). Weather radar and satellite imagery along with rain and river gauge information form the core components of the BoM's flood prediction service.

The BoM prepares flood forecasts for key locations based on rainfall runoff model outputs and issues flood warnings for specific locations throughout Victoria. Melbourne Water operates in a similar manner for locations within its area of responsibility. Until a number of flood events have occurred and relevant data has been captured and used to calibrate the flood forecast model, forecasts are likely to be subject to substantial uncertainty and must therefore be considered as indicative only.

The accuracy of this prediction will depend on a number of factors, including the type of flood forecasting model and its input data. Predicted river heights are subject to forecasting error and are regularly updated as more information becomes available.

In providing flood predictions there is understandably a trade off between timeliness and accuracy. The VFR heard that warnings were not issued early enough while at the same time others were critical of inaccuracies in warnings. Collection of data, analysis and confirmation takes time. The BoM focus on both the accuracy and timeliness of their forecasts although it is not clear to what extent the timeliness element drives the review and assessment process. The VFR was advised that it is practice for the BoM to hold off on providing forecasts for downstream locations until upstream locations have peaked. While this practice prevents the promulgation of a preliminary forecast of the peak and avoids the issue of more than one forecast peak being available within the community, thereby potentially creating confusion, it ignores the need for the downstream community to have some guidance on what their initial response actions should be and prevents informed early preparation. It denies the primary reason for the forecasting service at the expense of technical accuracy. However, the VFR notes that there is little value in a perfect forecast that is delivered after it is too late to initiate damage reducing actions.

As discussed earlier, the BoM in providing river height and flood peak predictions are dependent on gauges often owned and maintained by other organisations. The VFR heard what could only be described as circular arguments in relation to capacity to make accurate and timely predictions. Some attributed deficiencies in flood predictions to be a consequence of inadequacies of the BoM's prediction framework, while others attribute the lack of gauges that should have been installed by state agencies.

Perhaps the greatest example of inadequacies of flood level predictions was within the North Central CMA region where the BoM can provide predictions for only a small number of towns. Table 1 lists towns for which the BoM currently provides flood level predictions. For all other towns and areas, VICSES relies upon the knowledge and experience of North Central CMA staff.<sup>49</sup>

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49 North Central CMA submission to VFR, 26 May 2011

*Table 1: Towns in the North Central CMA region for which the BoM provides a flood level prediction<sup>50</sup>*

River	Town
Avoca River	Charlton
	Quambatook
Loddon River	Newstead
	Kerang
Campaspe River	Rochester
	Echuca
Murray River	Echuca
	Torrumbarry
	Barham
	Swan Hill

The VFR is aware that North Central CMA, in conjunction with consulting hydrologists, undertook numerous calculations and produced maps for many more areas within the region. In addition to the BoM data, the North Central CMA used local knowledge to inform its predictions where this was available. The towns for which North Central CMA provided predictions are outlined in table 2 below.

*Table 2: Towns for which the North Central CMA made flood predictions*

River	Town
Avoca	Charlton, Quambatook, Lark Charm, Mystic Park, Lake Boga
Loddon	Castlemaine, Campbells Creek, Newstead, Newbridge, Bridgewater, Serpentine, Durham Ox, Boort, Bears Lagoon, Calivil, Mitiamo, Pyramid Hill, Kerang, Murrabit West, Benjeroop, Pental Island
Campaspe	Elmore, Rochester, Strathallan, Echuca
Avon-Richardson	Donald
Murray	Echuca, Torrumbarry, Murrabit, Pental Island, Swan Hill, Tyntynder Flats

As a consequence of limited formal predictions by the BoM for the region, coupled with apparent lack of flood plans in many areas, the CMAs estimates often led to significant community criticism. The VFR notes that the VFWCC in its flood warning development plan listed as the highest priority an enhanced TFWS for the Loddon Valley.

In other regions, it is likely that predictions meet community or organisational needs. Southern Rural Water (SRW) believes that the flood predictions provided by the BoM via a range of rainfall runoff scenarios when major rain is predicted is sufficient to enable them to undertake good planning and preparation, particularly in the Macalister catchment.<sup>51</sup>

The VFR heard that lead times for flood warnings downstream of water storages in January 2011 were inadequate. Water storages in Victoria are operated for water supply purposes and do not have a significant flood mitigation role. The aim is generally to end the winter-spring filling period with the storage at or near full supply level. The operation of storages during the flood events is discussed later in this report.

Flood warnings issued by the BoM for locations downstream of gated storages (Cairn Curran Reservoir, Lake Glenmaggie, Lake Eildon) generally relay information from the storage operators on current or proposed outflows. As outflows are usually determined from calculated inflows based on reservoir head gauge readings, the lead time on these warnings is short. For storages on catchments that respond quickly to heavy rainfall and that are small relative to the size of the catchment (for example Lake Glenmaggie), the lead time can be very short and outflows can increase quickly. The net result in these situations is that flood warnings end up providing advice of essentially current outflows with no indication of the likely peak flow or the final scale of the event. This is not conducive to effective flood response as it provides the at risk community with little warning lead time or information about expected future conditions.

The VFR believes that if suitably qualified forecasts and warnings were provided of storage spills then warning lead times to those potentially impacted could be improved.

The VFR has noted the BoM's improved ability to forecast the occurrence and general location of heavy rain events. It has also noted improvements in rain and river data availability and coverage in the catchment areas of the state's larger reservoirs as well as improved hydrologic modelling capabilities.

<sup>50</sup> ibid

<sup>51</sup> Southern Rural Water submission to VFR, 16 May 2011



The use of a hydrologic model that incorporates a suitable reservoir model in conjunction with forecast rainfall (or observed rainfall in conjunction with forecast rainfall) would provide initial forecasts of possible flooding conditions downstream of storages.

While the VFR acknowledges that the initial flood forecast (in terms of the time to exceed critical flows or levels and the time and value of the peak) is likely to be fairly broad and thus exhibit a fair degree of uncertainty, it will provide a more timely estimate of likely flooding and an earlier indication of the likely scale of the event. This in turn will provide additional lead time for communities to prepare for flooding. Later forecasts would need to be refined based on advice of outflows from storage operators (or from downstream gauges) as is currently the case.

The VFR acknowledges that there are substantial issues associated with uncertainty, accuracy and messaging which would need to be addressed before revised arrangements could be implemented. In particular, the VFR is concerned that storage operators may be blamed for flood damage in cases where the flood peaks above the BoM's initial prediction.

The technology exists to enable an improved forecast lead time downstream of storages. Institutional arrangements and the understandings to enable the improvements to be utilised need to be addressed. It is acknowledged that the benefits of such modelling may not be relevant to all water storages. The VFR is of the opinion that the cost-benefit of implementing these new arrangements should be clarified during the development of a revised flood warning system for each basin that considers community needs for timely and accurate warnings.

Weather radar forms a core component of the BoM's forecasting tools. Weather watch radars are very effective tools for the detection of rain. The BoM forecasters interpret the patterns and intensity of the radar images to provide warnings of major weather events such as severe thunderstorms, tropical cyclones and areas of heavy rainfall. The radar does not 'see' clouds, as cloud droplets are too small, but does see the rainfall which those clouds produce.<sup>52</sup>

In the 2009–10 Federal Budget the BoM received \$48 million over seven years to implement the Strategic Radar Enhancement Project (SREP) which will see the installation of four new radars (none in Victoria), the installation of a verification network for each new radar and to improve the underlying science for extreme weather forecasting. The BoM propose that SREP will lead to the provision of improved rainfall estimation and short-term forecasts for heavy rainfall events, which will inform planning, preparedness and minimisation of impact from flash flooding events.<sup>53</sup>

Despite the proposed improvements in forecasting resulting from research, the BoM has acknowledged that there is a radar blind spot in the Horsham/Nhill region with the result that their ability to provide accurate rainfall and storm predictions in that area is limited. Further limitations of the BoM's radar coverage are provided on their website. For example, although the Mildura radar has a very good view in all directions, if there are large thunderstorms around, the radar will not be able to detect accurately the strength of storms located behind the closest storms. This will lead to the underestimation of the strength, at times, of very intense, isolated storms.

The VFR is aware of the significant costs and technology limitations in providing high-resolution radar coverage across Australia. However, the VFR encourages the BoM to continue to review and where necessary, enhance its radar standards and coverage for flood risk areas as part of its flood warning service to Victorian communities.

#### **Recommendation 12:**

The VFR recommends that:

the Bureau of Meteorology undertake a review of its radar coverage in the context of flash and riverine flood warnings for Victoria, with a particular focus on known gap areas such as the Horsham/Nhill region.

#### **Recommendation 13:**

The VFR recommends that:

the Bureau of Meteorology adjust its flood prediction models to incorporate water storage conditions (to enable it to issue more timely and useful flood predictions for communities based downstream of water storages).

52 Bureau of Meteorology website, [http://www.bom.gov.au/weather/radar/about/radar\\_site\\_info.shtml](http://www.bom.gov.au/weather/radar/about/radar_site_info.shtml)

53 *ibid*

## Interpreting predictions to provide flood intelligence

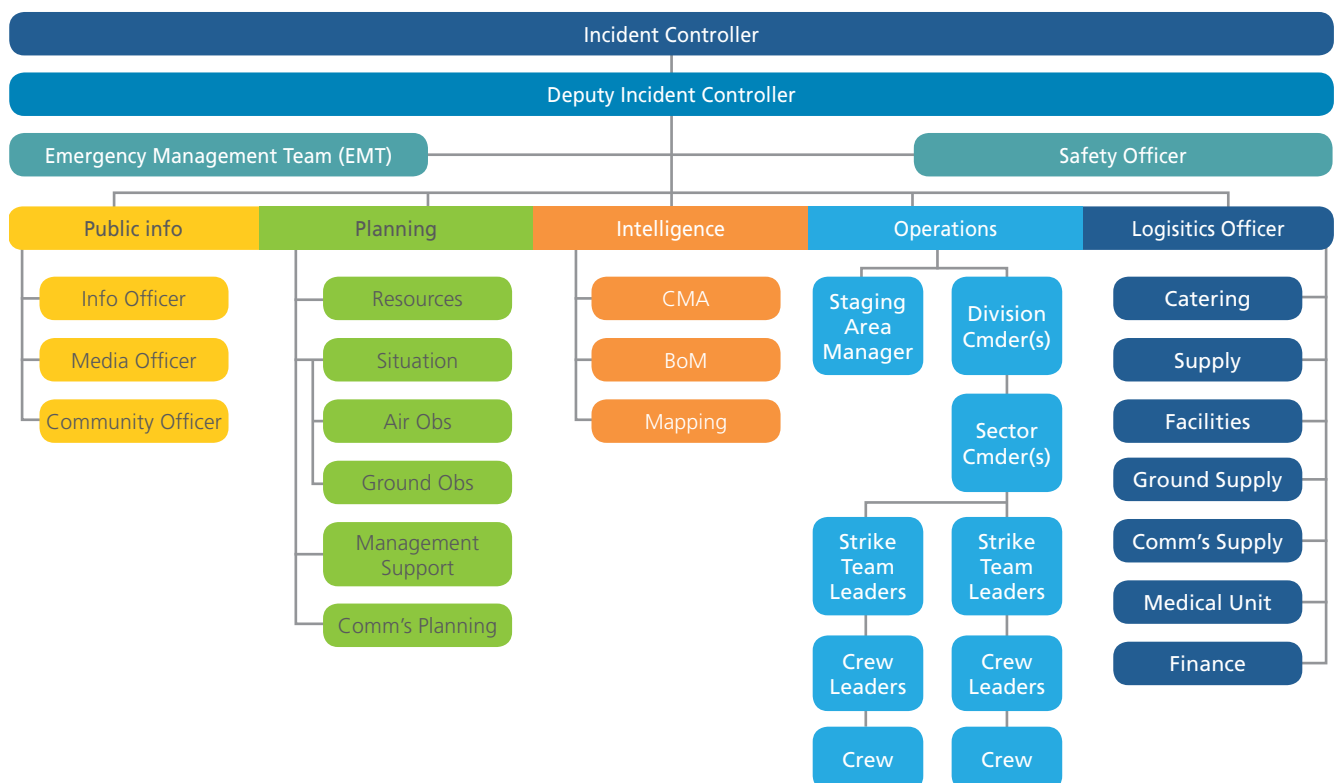
Flood prediction, whether it be potential river height, flow rate, location or timing of flood peak, becomes far more useful for communities and emergency service organisations if it can be translated into potential extent (how much of the floodplain is likely to be flooded), duration (how long will the flood continue) and the potential consequences for infrastructure, roads and property. The translation of rainfall and river height predictions provided by the BoM into more meaningful information is broadly described as flood intelligence.

Real time intelligence and situational awareness at both the agency and the individual level is crucial, as is the ability for an incident management team (IMT) to rapidly construct and disseminate meaningful information and warnings. Put simply, flood intelligence is about being ahead of the game.

The existence of flood intelligence enables VICSES to determine, based upon flood predictions, the likely impacts of flooding, what actions will need to be taken by response agencies and what information and advice should be provided to community members. However, little flood intelligence is currently held by VICSES and as such, the organisation has a strong dependence on other organisations such as DSE, CMAs and local government to provide information.<sup>54</sup>

During the flood events, the VICSES established IMTs. Within the IMT framework, an intelligence cell (see figure 5) is established with the purpose 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.<sup>55</sup> DSE, CMAs and consulting hydrologists with expertise in flood mapping and flood behaviour largely undertook this function which is seen as invaluable.

Figure 5 – IMT indicating Intelligence Cell



54 Victoria State Emergency Service, *Draft State Flood Response Plan V2.12*, May 2011, p.13

55 Victoria State Emergency Service, *Managing Floods using AIIIMS – Learning Manual*, 2008

It is apparent that some CMAs interpret their support role to VICSES differently and consistency in this area would be beneficial.<sup>56</sup> The VFR heard from a number of CMAs that one of the key duties undertaken while in the intelligence cell of the ICC was the constant production of maps. This was reported as a significant drain on CMA resources as organisations do not have enough trained staff to provide the service over a sustained campaign. In other instances, councils were requested by VICSES to produce maps.<sup>57</sup> Inconsistent command and control arrangements and accepted practices are clearly unhelpful and consequently roles and functions need to be clarified.

In addition to the employment of consulting hydrologists by VICSES, CMAs sourced geographic information systems (GIS) and floodplain management staff from other CMAs outside of the flooded regions. The arrangements for sharing staff across CMAs are presently informal. The VFR is aware that discussions between CMAs have taken place to initiate mutual aid arrangements. Similar arrangements, together with a continuous understanding of the availability and capacity of the consulting hydrologists, would be highly beneficial.

The VFR also heard that one of the challenges for those involved in incident management for the first time was that they were unfamiliar with the command and control process and reporting arrangements. An understanding of the Australasian Inter-Service Incident Management System (AIIMS) and ICC framework would better facilitate information transfer in an IMT environment.

It is the view of the VFR that the planning and operational roles in AIIMS would benefit from an improved technical understanding of flood behaviour, which would enhance information transfer within the ICC. The VFR heard that information and products provided by the BoM and developed by the intelligence cell became more useful during the January and February flood events due to increased usage and understanding.

#### **Recommendation 14:**

The VFR recommends that:

the state clarify the role of intelligence cell staff (for example, hydrologists and/or Catchment Management Authority) who are utilised in Incident Control Centres during flood events.

#### **Recommendation 15:**

The VFR recommends that:

the state ensure that all personnel who, because of their particular flood expertise, are likely to be potential participants in an Incident Control Centre are familiar with the requirements of the Australasian Inter-service Incident Management System structure.

#### **Recommendation 16:**

The VFR recommends that:

the state ensure that all personnel who are likely to become involved in incident management teams for floods receive basic flood awareness training prior to such involvement.

#### **Recommendation 17:**

The VFR recommends that:

the state establish appropriate arrangements to ensure the capacity to maintain technical expertise for flood intelligence is initiated, including appropriate agreements with commercial experts.

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<sup>56</sup> North Central CMA submission to VFR, 26 May 2011

<sup>57</sup> VICSES Multi-agency Flood Debrief September 2010

The ability to translate river height into more meaningful information is highly dependent on prior preparation and experience with previous floods. It is not surprising that flood intelligence was significantly better in those areas where extensive flood mapping had been undertaken, the gauge network well developed, flood risk to essential community infrastructure previously identified and those charged with constructing the intelligence had experienced previous flooding.<sup>58</sup>

The VFR is aware of the difficulties in constructing potential flood behaviour throughout each catchment. However, in many cases, it was localised information that was important to communities as it informed localised responses, particularly in areas for which flood predictions were not available. There is a range of information required by emergency service organisations and communities, including the likely time that flood water will exceed critical levels at key locations (for example, overtopping of levees, key roads, levels at which essential infrastructure and/or buildings are first surrounded by floodwaters and/or flooded over floor).

In areas of flood risk, this information should be contained in flood sub-plans of the MEMP. The purpose of the sub-plan is to detail arrangements agreed for the planning, preparedness, response to and recovery from flood incidents at a local level. While councils are required by law to prepare a MEMP, the preparation of a flood sub-plan is not a mandatory component of the MEMP, even where there is a significant flood risk.

The need for preplanning was well summarised by Central Goldfields Shire who stated that there is currently a reactive approach to emergency management planning in response to the VBRC and now the recent floods. More emphasis must be put into long term planning to avoid risk to communities including warning systems and flood protection works for at risk towns rather than a narrow focus on combating events.<sup>59</sup>

The VFR is aware that in many of the flooded areas, there was an absence of flood sub-plans. Where they do exist there is a considerable variance in standards with some little more than a shell document. The VFR repeatedly heard of the frustrations arising from gaps in knowledge or intelligence, which can be gathered well in advance of an event. Considerable effort was expended in endeavouring to seek such information in a time critical environment, delaying processing of data which support warnings.

The benefits of prior planning and preparation were demonstrated in Horsham as outlined in the case study on the following page.

While the construction of flood mitigation structures falls outside the VFR terms of reference, it is necessary to discuss temporary alterations to the landscape to redirect floods and the performance of existing levees in the context of their interface with flood prediction and intelligence.

The VFR is aware that there were numerous instances where temporary levees were constructed during the floods. Where there is limited localised knowledge of flood behaviour due to lack of flood planning and preparation, these actions were undertaken with poor understanding of broader consequences, including unforeseen outcomes. While not discussing the objectives or merits of the temporary levee construction (the VFR is aware that temporary levee construction significantly reduced the number of houses flooded in some areas such as Warracknabeal), there is concern that such actions can dramatically reduce the ability to predict the movement and depth of floodwater. Notwithstanding any legal requirement for works approvals or liability issues that may arise, it is paramount that such high risk activities be approved through the appropriate processes to ensure due consideration of both positive and negative potential effects of redirecting flood water.

The performance of existing levees also affects the ability to assess flood behaviour during an event. In the Loddon Valley alone, there were in excess of 90 breaches of the levee system. The control agency clearly needs to understand the implications of levees on the movement of flood water during the event. The condition and likely performance of levees is best considered during planning prior to the flood event.

#### **Recommendation 18:**

The VFR recommends that:

the state ensure that regional and local flood plans incorporate all available flood mapping and intelligence, including assessments of levees and flood consequence information.

#### **Recommendation 19:**

The VFR recommends that:

the state develop an efficient process to ensure that, during flood events, temporary construction of flood mitigation works, such as levees, is controlled so as not to unacceptably impact on flood intelligence.

58 North Central CMA submission to VFR, 26 May 2011

59 Central Goldfields Shire Council submission to VFR, 27 May 2011

## Case study – Horsham

There has been considerable preparation for flooding at Horsham. This preparation, including detailed flood mapping and assembly of relevant flood intelligence, provides a good understanding of flood risk and a sound base from which to initiate flood response.

The Wimmera CMA Regional Floodplain Management Strategy of 2001, identified the assessment and treatment of the flood risk at Horsham as a key priority. Subsequent to 2001, a number of investigations were undertaken including the Horsham Flood Study, which identified and analysed flood risks and the Horsham Floodplain Management Study and Plan, which assessed, prioritised and proposed measures aimed at mitigating the risks.

The investigations were conducted with the close cooperation of Wimmera CMA, VICSES, Horsham Rural City Council, BoM and GWMWater. Each of the investigations included extensive community consultation.

The investigations led to the following deliverables:

- flood inundation maps for a range of flood events that show flood extent, flood depths and affected properties, both above ground and over floor
- a flood emergency plan that contains relevant flood intelligence extracted from the study reports and the flood inundation maps and which has since been incorporated into the Horsham MEMP
- improvements to elements of the flood warning system and comprising additional event reporting rain and river gauges within the catchment, individual property specific flood level cards and a Horsham specific flood information brochure
- a draft flood warning service level agreement.

The additional real time rain and river data assisted in determining and confirming the scale of the events in September 2010 and January 2011. This was particularly important during the January event which was similar to the 1909 flood with a return period of around 200 years. The additional data increased confidence in BoM predictions for the gauge at Walmer, downstream from Horsham, which was provided with good lead time. In January, the intelligence contained in the flood emergency plan coupled with the inundation maps guided VICSES and Horsham Rural City Council flood response activities. As the flood emergency plan and maps identified properties, assets and infrastructure at risk, community messaging was accurate and appropriate flood protection works were completed within the town in an orderly manner well ahead of the flood. The flood inundation maps also enabled an informed assessment of the risk of the Horsham power terminal station being flooded.

Initial assessment has indicated consistency between the flood inundation mapping and on ground observations of flood extent, depths and overall flood behaviour.

While the lead time available at Horsham is more than for many other Victorian communities, the benefits of comprehensive flood inundation maps for a range of design floods that include events in excess of the 100 year event and the extraction of the intelligence from those maps were clearly demonstrated in January 2011. A downside to the benefits is that the mapping and intelligence was primarily restricted to the urban area of Horsham.

The VFR is of the view that flood preparedness at Horsham provides an example of good practice which informed an ordered and timely response and assisted in minimising avoidable flood related damage. Extension of these preparedness activities to other communities in Victoria would facilitate a step change in flood warning services: from examples of good practice to a statewide model of best practice.

The VFR supports the Wimmera CMA's stated intention to survey the floor level of other houses within the Wimmera floodplain as a first step in extending the mapping, flood intelligence and property flood level information to the rural area. The VFR also supports the CMA's proposal to load flood inundation maps to local websites in order to increase flood awareness and assist individual flood response. The availability of this information will enable people who know their floor level to calculate to what extent a flood may affect their property.



## Communication with the Bureau of Meteorology

Flood emergency incident controllers have a critical dependence on information provided by BoM concerning river heights and the timing of flood peaks. This information can be obtained via the BoM website or by direct contact with the BoM.

In recognition of the importance of this dependence, a memorandum of understanding (MOU) exists to ensure that a BoM qualified meteorologist is present at the SCC whenever severe weather conditions are anticipated. This provides a readily accessible means for incident controllers to better interpret weather forecasts, clarify points of uncertainty or communicate critical messages from the BoM flood forecasting team.<sup>60</sup> The arrangement is seen as invaluable and the VFR supports the continuation of this practice.

VICSES maintain standard operating procedures (SOPs) for the notification process for severe weather events, including information sourced from the BoM. The SOP was last updated in March 2010.<sup>61</sup> These arrangements were largely followed during the flood events.

The BoM continuously revises predictions based on new data received from the rainfall and stream gauging network. In spite of real time data being available at a number of locations, there is concern that there were times when data was slow to be updated on the BoM website, in some cases in excess of three hours.<sup>62</sup> The VFR heard that, while rare, there were instances where BoM staff could not be contacted during the night to verify flow data or to provide updated predictions.

The VFR is aware of a gauge at Yawong that, after sustaining damage, continued to transmit incorrect information. The error was not discovered for approximately half a day, during which time incorrect information was being provided to emergency services and communities seeking information from the website.

The VFR is of the opinion that there is considerable value in real time access to information from gauging sites, which does not require communication directly with the BoM. The benefits include:

- quality assurance of gauge data would be undertaken by intelligence cells of ICCs in addition to processes undertaken by the BoM, which will identify those gauges malfunctioning in a more timely manner
- information from gauges is fed directly into the ICC rather than delayed
- opportunities for resources within the BoM to be redirected to preparing predictions rather than uploading flow data.

### Recommendation 20:

The VFR recommends that:

the Bureau of Meteorology provide Incident Control Centres with real-time access to flood data held by the Bureau of Meteorology. This will require Bureau of Meteorology staff making themselves available to respond to enquiries from Incident Control Centres during a flood event.

## Availability, extent and quality of flood mapping

Flood maps are prepared for areas of flood risk. Maps are used for local government landuse planning and by VICSES during flood emergencies to help translate prediction information provided by the BoM into water depth and extent of flooding likely across the floodplain. Land use planning on floodplains is discussed further in Chapter Six of this report.

The benefits of comprehensive mapping during the emergency response phase were well demonstrated in places such as Horsham. However, equally telling was the lack and quality of flood mapping in many regions such as Victoria's north central and south west and even some urban centres. The VFR notes a high level of confusion regarding roles and responsibilities for initiating flood mapping (a CMA or local government responsibility) and to what standards these maps need to be produced.

60 BoM Correspondence to VFR, 11 August 2011

61 Victoria State Emergency Service, *Standard Operating Procedure No. 008*, 2010

62 North Central CMA submission to VFR, 26 May 2011

Under section 203 of the Water Act, CMAs have a statutory obligation to maintain and enhance information about riverine flooding and to declare flood levels. In determining a flood level, the Water Act states the CMA “may adopt a flood level... which, in its opinion, is the best estimate, based on the available evidence, of a flood event which has a probability of occurrence of 1 per cent in any one year”.<sup>63</sup>

Approximately 80 per cent of the floodplains in the state are mapped for a 1 in 100 year event. However, while these maps provide a useful tool for flood planning, they are of little value in emergency response as they provide no guidance on flood depth, velocities or flood extent for smaller or even larger events. Consequently, few regions have maps suitable for use during emergency response. Maps are critical in assessing the likelihood of:

- land, dwellings or businesses that may be flooded
- key roads being cut
- overtopping levees
- essential infrastructure being inundated or closed down.

A number of reasons were proposed to the VFR for the absence of reliable mapping. These included funding constraints and the fact that floods of this magnitude were unprecedented in many areas of the state. In addition, VICSES noted that while there has been over 250 flood studies completed throughout Victoria, the scope and accuracy of mapping varies due to developing industry standards and practices over time.<sup>64</sup> Glenelg-Hopkins CMA noted that the majority of flood maps in south west Victoria are derived from aerial photos (often not flood related) and are, in their opinion, of low reliability.

Despite the above, there has been progressive improvement in flood mapping in Victoria. Technical advances in remote sensing have reduced the cost of developing detailed terrain maps required for floodplain mapping. High quality information is now more affordable than it was 10 to 20 years ago. However, the VFR notes that there is a strong reliance on sporadic initiative funding or NDRGS funding. CMAs, local government and DSE acknowledge that past funding sources are inadequate to ensure flood maps remain contemporary.

DSE has advised that there is general guidance in place for producing flood maps, but currently there are no formal standards including process (for example, consultation) requirements. One of the main obstacles has been that historically local government or CMAs have sought Commonwealth Government funding and it has been difficult to apply standards to projects funded from external sources.

The VFR is aware that standards are in development for use during the rollout of new flood mapping for up to 25 communities as announced by the Victorian Government on 2 May 2011. Importantly, these new flood mapping projects are required to include multiple flood levels (range of Annual Exceedence Probability (AEP)) and are therefore invaluable during emergency response. Regardless of the funding source, the VFR is of the view that specified quality and consistency of flood mapping is necessary.

Over time, landscapes change with significant alterations to farming practices, construction of roads and highways, development on floodplains and levees no longer functioning as originally designed. All those factors contribute to the difficulties in predicting the extent of flooding. This raises the issue of currency of flood mapping and the necessity for periodic updating time in order to provide an appropriate level of flood prediction service to the community.

At present, there are no standards or ongoing processes to update existing maps. The frequency in which flood mapping is updated requires consideration. It has been suggested that flood plans be amended every five to 10 years, or after a severe flood.<sup>65</sup> The VFR is of the view that an arbitrary timeline is not necessary and that revisions to flood mapping take place after a severe flood event or where major landscape changes occur that are likely to affect flood behaviour.

A number of councils advised the VFR that they were considering altering the flood overlays within the planning schemes as a consequence of the floods. Concern was also expressed to the VFR that a number of flood maps did not extend beyond the 1 in 100 year event boundary. Both these issues are discussed in detail in Chapter Six. Other flood maps were not necessarily linked to a gauge and were therefore of limited use in providing intelligence during the flood event. New maps should consider the breadth of flooding in a region (i.e. extend to the Probable Maximum Flood (PMF) and not limited to the arbitrary 1 in 100 year event flood extent), provide information across a range of flood intervals and be explicitly linked to a gauge.

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63 Water Act 1989, s 204

64 Barry, M. “Total Flood Warning Systems”, *Australian Journal of Emergency Management*, Vol. 23 No.3, 2008

65 SCARM, Report No.73 *Floodplain Management in Australia: Best Practice Principles and Guidelines*, 2000

In Victoria, floodplain mapping occurs for a range of purposes including flood risk assessment for land use planning, provision of intelligence for emergency response and a range of natural resource management programs (such as vegetation and wetland mapping). The VFR is of the opinion that efforts in flood mapping should, to the fullest extent possible, extract maximum benefits across all purposes.

The VFR notes the review of flood mapping currently being undertaken by the Commonwealth Government as part of the National Disaster Insurance Review.<sup>66</sup> The review, being undertaken in light of the debates on insurance coverage and ability to understand flood risk, is expected to discuss the responsibility for flood mapping and standards. The review presented its report to the Federal Assistant Treasurer at the end of September 2011 for his consideration. The final report will be provided to the Commonwealth Attorney-General as chair of the Ministerial Council for Police and Emergency Management for consideration in implementing the NSDR as agreed by COAG in February 2011.

On 13 February 2011, COAG endorsed the NSDR. The NSDR provides high level guidance to federal, state, territory and local governments, as well as the business community and the not for profit sector, on priority areas for action in building a more disaster resilient Australia. As part of implementing the NSDR, the Commonwealth Government is looking to establish a national approach to flood modelling including mapping. The VFR notes a report has been prepared by the Attorney-General's Department (AGD), and is currently under consideration by other Commonwealth Government departments and the states.<sup>67</sup>

While the VFR recognises the review processes presently underway to improve flood mapping, flooding in Victoria has highlighted particular issues that should readily inform the Commonwealth processes.

### Recommendation 21:

The VFR recommends that:

the state establish standards for flood mapping to ensure they are kept contemporary and meet the purposes of landuse risk planning and emergency response. In doing so, maps should extend where appropriate to include Probable Maximum Flood, over a range of Annual Exceedence Probability levels and be explicitly linked to a stream gauge.

### Incorporating local information into flood management

Communities shared with the VFR their frustration regarding the apparent lack of knowledge or understanding by emergency services of flood behaviour in their local area. The VFR heard that there were instances where local knowledge, whether from flood wardens or other community members, was disregarded as an information source. Others praised the efforts of, and quality of, information provided by local flood wardens. The VFR was unable to identify the number of telephone calls or attempts by local communities to provide information into the management of the flood event, although the issue was consistently raised during the VFR's community consultations.

66 <http://www.ndir.gov.au/content/Content.aspx?doc=home.htm>

67 Commonwealth Attorney-General's Department, *Report on the Environmental Scan into A National Approach to Flood Modelling*, June 2011

## Flood wardens

Flood wardens are community minded individuals who volunteer their time and expertise to assist their communities respond to flooding. They relay information about flood flows from a source to those at risk and vice versa (for example, for the Macalister River downstream from Lake Glenmaggie) and assist in local flood response activities within particular areas of the floodplain by coordinating activities, acting as a link between the community and council (for example, at Swan Hill for Pental Island and Tyntynder Flats). In the latter instance, the flood wardens variously acted as a community focal point for flood information, coordinated local flood response activities in relation to levee maintenance and management and provided local information back into the MECC and ICC. There is no formal definition or duty statement for the role of flood wardens (as duties and expectations vary depending on location). It appears to the VFR that appointment is based on a combination of past flood experience and knowledge coupled with a willingness to be involved. While the issue of individual liability was not raised with the VFR, it is understood that the Macalister flood wardens are covered by VICSES' volunteer insurance but that other wardens are assumed to be covered by council's insurance.

Local knowledge should be utilised to value add to information unilaterally to predict flood behaviour. In some areas, without pre-established flood intelligence, there was a strong dependence on local information. Despite the views that there was little local knowledge incorporated into the flood response, the VFR was able to identify occasions where such information was used for decision making.<sup>68</sup>

The VFR heard of further frustrations of those who had lived through previous floods and understood the likely flood behaviour were unable to persuade emergency service organisations to listen. However, Buloke Shire Council noted that local planning based on previous experience and knowledge was of little value as water was 'behaving' in ways outside the experience of even the oldest 'flood hands' in the town (although local knowledge was useful once the event unfolded).

There is significant support for the involvement of locals in flood planning and management that not only provides important information but also improves the likelihood that people will understand flood behaviour and respond to warnings. Consequently, the value of local information cannot be underestimated.

The VFR believes there is room for considerable improvement in the way information from communities is utilised for flood planning and emergency response. Several community members at Kerang noted that information they could provide about flooding would be best captured after a flood event and incorporated into flood plans and flood response plans in preparation for future flooding. Flood prone communities are not consistently involved in the development, design and delivery of flood warning services in Victoria.

The VFR heard that community members had critical information including damage to gauges or levee breaches. While such matters do not require intervention from emergency organisations, it is highly valued information.

The VFR also heard that some members in flood prone communities had a great influence on local community decision making during the floods, but their knowledge of flood consequence did not match the influence they had. In some areas the VFR heard that this 'influence' was taken a stage further with some community members making decisions and authorising works including the construction of levees and ordering resources such as earthmovers for construction works. These decisions occurred, often without the knowledge of either the control agency's ICC, CMA or the MECC. Further, because some of the works were performed without adequate supervision, some existing levees were unnecessarily damaged by attempts to top up or strengthen.

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68 Swan Hill Rural City Council submission to VFR, 26 May 2011

Other agencies were unclear about what could or could not be done in relation to the requirements of the Water Act to protect properties from flood waters. Wimmera CMA advised:

*During the flood informal levees were erected in haste with no understanding of their impact on pushing floodwaters onto other parts of the floodplain and the devastating consequences should they fail. Many such levees were constructed with little consideration of engineering safety requirements in mind. While these levees remained mostly intact during the floods, if they had failed floodwaters would have been trapped and flooded many houses that would not otherwise been subject to flooding. The legal ambiguities need to be clarified and community members and agencies need to be fully aware of the risks and liabilities that occur when creating ad hoc flood defences beyond the perimeter of their houses.*

While it could be argued that these activities were undertaken with good intention to protect community or individual assets or in light of the apparent inability of the emergency management arrangements to provide such assistance, it cannot be ignored that these unauthorised actions by community members have potential major liability issues and cost implications.

The VFR is of the opinion that local knowledge should inform the decisions of those responsible for response activities within the emergency management framework.

The VFR considers that accreditation of community members would strengthen the communication and information sharing processes from communities to the control agency and vice versa. The accreditation process should include an understanding of the AIIIMS framework and training in data collection. This will ensure quality information is provided to the control agency, particularly where there are significant implications from the information provided.

The BoM utilises volunteer amateur weather observers (for example, storm spotter, rainfall and river height networks). The VFR notes the Commonwealth Government's intention, in response to the Queensland Floods Commission of Inquiry, to progress actions through the BoM to expand and support the volunteer network. The VFR is of the opinion that a similar arrangement would enhance capacity to predict and respond to flooding in Victoria.

#### **Recommendation 22:**

The VFR recommends that:

the state take the necessary measures to require that local knowledge is considered in flood risk planning, including verification of flood maps and flood response plans.

#### **Recommendation 23:**

The VFR recommends that:

the state establish a process for volunteer community member accreditation to allow volunteers to provide flood information to the control agency during a flood event. This process should establish a base competency standard and provide appropriate emergency management and Australasian Inter-service Incident Management System training to accredited community volunteers.

#### **Recommendation 24:**

The VFR recommends that:

the Bureau of Meteorology expand its volunteer amateur weather watch groups to enhance its weather and flood information gathering procedures.



## Dam operations and communication

The VFR is aware through community consultation activities that there is concern around the adequacy of the operation of dams during the flood events. There is a level of expectation that dams in Victoria should be operated to prevent flooding and, in some instances, there were claims that the operation of storages exacerbated flooding.

Future alterations to the operation of water supply infrastructure (including dams, weirs and water supply distribution and drainage systems) for flood mitigation purposes is outside of the VFR's terms of reference. However, the VFR has reviewed the existing governance arrangements for storages and assessed whether the storages were managed consistently with these arrangements during the 2010–11 floods. In addition, the VFR also considered the role of dam owners and operators in providing information to communities and the control agency during the flood events. The VFR engaged Sinclair Knight Merz to undertake an examination of the operation of storages.<sup>69</sup> The examination focused on three systems of community concern:

- Lake Eppalock (Campaspe River System)
- Cairn Curran Reservoir, Tullaroop Reservoir and Laanecoorie Reservoir (Loddon River System)
- Wartook Reservoir and Lonsdale Reservoir (Wimmera River System).

GWMWater (responsible for urban and rural supply systems in the Grampians, Wimmera and Mallee regions) is the storage manager for Wartook and Lonsdale reservoirs. Goulburn-Murray Water (G-MW) is the storage manager for the reservoirs on the Campaspe and Loddon rivers. As storage managers under the *Water Act* and *Water Industry Act 1994*, G-MW and GWMWater have obligations to ensure reliable supply of water to primary entitlement holders and to manage the storages safely. The legislation also lists a number of other objectives including provision of flood mitigation where possible (i.e. without compromising reliability of supply and dam safety). While these storages do provide flood mitigation benefits, such benefits are incidental to their primary purpose. The storage managers are highly constrained in their ability to provide flood mitigation by the need to supply primary entitlement holders and ensure dam safety.

The reliability of forecast rainfall information at the regional scale means little more than four days warning of heavy rainfall is available. At the catchment scale, reliable warning of heavy rainfalls upstream of a particular reservoir may allow a lead time of two days or less. Coupled with the relatively small capacity of low level outlets at the storages, storage operators have limited ability to provide significant airspace for flood mitigation.

The operating policies and procedures put in place by G-MW and GWMWater are generally consistent with legislative requirements as they relate to management of floods. While the water corporations operated consistently in accordance with legislation and policies, the VFR is of the opinion that documents outlining dam operation procedures and policies should be available to the public.

The VFR notes that water corporations actively participated in providing information to the BoM and VICSES in line with their support agency status under the EMMV. Situation reports were prepared by G-MW on dam, weir and system operation to inform the incident controller on the status of water supply infrastructure and water supplies. This provided useful information and consequently was well received by VICSES. The VFR is of the view that all water corporations should develop such situation reports for flood events.

The floods were monitored as they passed through the storages. The main exception to this was at Lake Lonsdale where telemetered reservoir water levels were not available and access to the reservoir was lost due to flooded roads. This raises the question as to the obligation on water corporations for providing information as part of the flood warning system, particularly in relation to dam inflows, outflows and storage levels. As flood warning systems for each catchment are reviewed it is appropriate that water corporations collect and provide information in relation to the management and operation of dams and weirs consistent with the flood warning requirements of the relevant river system, including the provision of telemetry at sites where necessary.

The VFR is aware that G-MW issued SMS (text) messages to pre-arranged community members below Cairn Curran Reservoir. In other regions, water corporations, such as SRW for the Macalister River system, advise community members through community established flood wardens. There appears to be little or no direct communication with downstream communities, below other dams, by the dam owners or operators during flood emergencies.

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69 Sinclair Knight Mertz Pty Ltd, *Review into the Operation of Storages During Flooding*, Victorian Floods Review, 29 September 2011

G-MW issued advice on dam pre-releases and during the January flood event, relayed warnings issued by the BoM to residents and businesses below Cairn Curran Reservoir. The community raised a number of issues with the VFR in relation to the information provided by G-MW including:

- SMS information was limited, promising further information which did not occur
- SMS did not reach all those on the G-MW contact list while others received only some of the messages
- warning arrived only 30 minutes before the flood surge arrived.

G-MW issue flood advice to registered communities below Cairn Curran Reservoir through SMS messages. SRW states on its website that the organisation does not issue flood advice, although flood wardens in the Macalister River area are provided with information on storage conditions and river flows.

It is of concern to the VFR that there is confusion in the community about the responsibility for issuing warnings. As discussed previously, communities have access to a range of informal and formal information sources to inform their decision making.

G-MW advised the VFR that the purpose of the SMS messages was to provide information to those immediately downstream of Cairn Curran Reservoir in recognition that landholders may not necessarily receive timely warnings from the BoM, VICSES or the Mount Alexander Shire. G-MW also expressed concern that the Baringhup community may become reliant on the flood information provided by G-MW.

While the system employed by SRW does not include the use of SMS, the importance of providing time critical information about impending floods to communities immediately downstream of storages cannot be overstated.

Part 3 of the EMMV states that the control agency has the responsibility for issuing warnings to the potentially affected community and to other agencies. The EMMV also states:

*Warnings and the release of other public information should be authorised by the Incident Controller prior to dissemination. Where an extreme and imminent threat to life exists and authorisation from the Incident Controller is not practicable in the circumstances, warnings may be issued by any response agency personnel.*

The guidance provided by the EMMV appears not to support information being provided by dam owners and operators to downstream communities about potential flooding in a time critical environment. The EMMV acknowledges that in the initial stages of some emergencies, it is possible that there may be little or no warnings provided to agencies or the community. The VFR is of the opinion that provision of advice directly to communities is necessary in a time critical environment. However, the arrangements are currently ad hoc and left to the discretion of the dam owner and operators on whether to undertake such a service. The VFR is of the opinion that the current Victorian Warning Protocol (VWP) of 2009, should be modified to include formal procedures. The VFR acknowledges that this form of communication may not necessarily value add to existing warning services in all situations.

In Australia there are only a few storages that provide flood mitigation as a primary purpose, however, none of these are in Victoria. Nonetheless, large on-stream storages can have a significant impact on riverine hydrology. Despite both legal and physical constraints on the storage operators in mitigating floods, storages on each of the river systems reviewed by the VFR provided a significant attenuation of flooding. This influence was most pronounced for downstream communities close to the storages, where in some cases a large degree of attenuation of the flood hydrograph was observed. For communities further downstream, this impact became less significant due to additional local inflows and the lessening effects as water flowed through the floodplain.

In all cases, the storages under consideration provided some flood mitigation benefit by reducing peak outflow to below peak inflow and delayed the timing of peak flows for communities in the area immediately downstream.

Between September and November 2010 a large volume of floodwater that would otherwise have resulted in moderate to major flooding of communities such as Rochester and Horsham was mitigated by storages on the Campaspe, Loddon and Wimmera river systems. The mitigation was primarily a result of the very low water levels in these storages due to the prolonged period of drought.

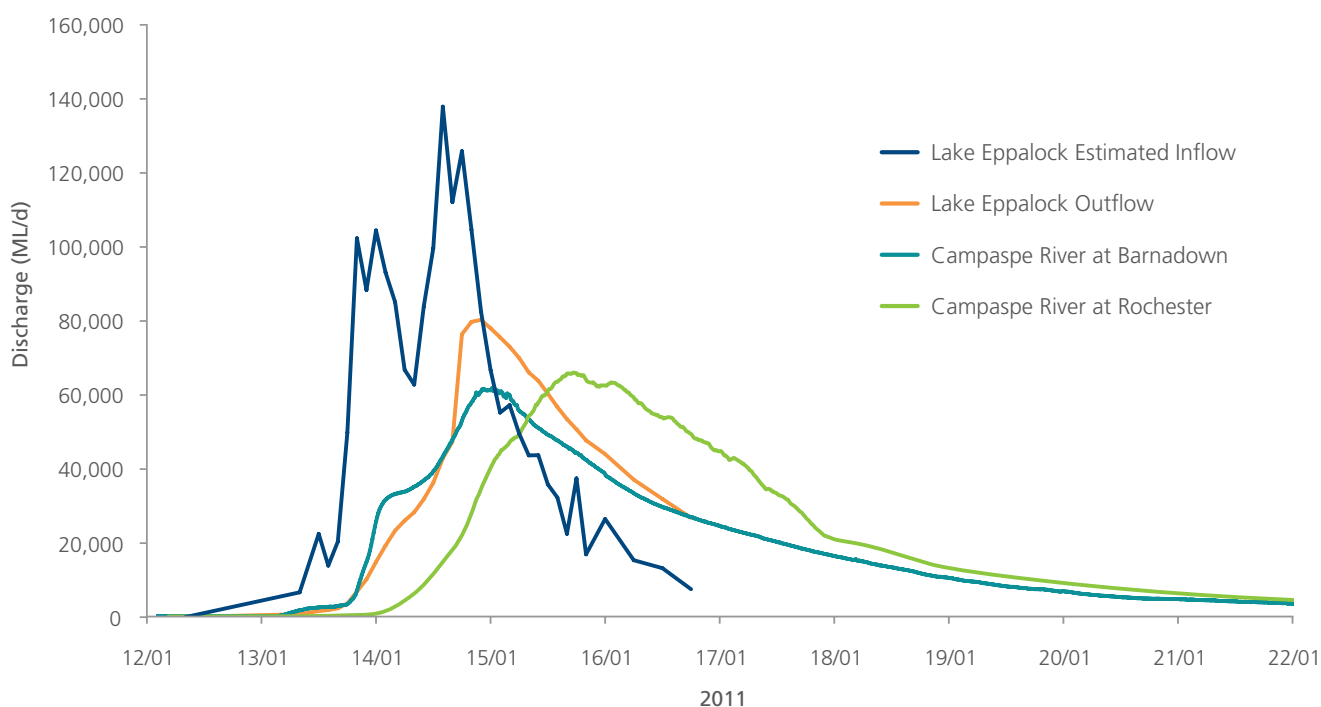
As an example of how the storages provided flood mitigation, Figure 6 shows the peak inflow into Lake Eppalock in January was approximately 140,000 ML/d, while the outflow peak was in the order of 81,000 ML/d.

The VFR also notes that in some situations, outflows from storages appear greater than inflows. Outflow greater than inflow as the flood level recedes occurs most commonly at fixed crest storages (for example, Lake Eppalock and Tullaroop Reservoir).

The nature of the fixed crest means that the operator has no ability to regulate outflow once the water level in the reservoir rises above full supply level. Outflow is a function of water level in the storage and is controlled by the physical characteristics of the spillway crest. The nature of the attenuation provided by such dams is that while the peak is reduced, the total hydrograph volume is conserved (this is when the storage may get above 100 per cent capacity) and therefore outflow is higher than inflow as the flood recedes. At Cairn Curran Reservoir, the gate operations generally meant that outflow was less than or the same as inflow, even as the floods were receding. The exception to this seems to be on 29 November when the outflow was maintained at moderate flood level in order to draw the reservoir down to provide airspace in the event of further high inflows.

There are formal communication and management arrangements covering dam releases for water supply outside of a flood event. The VFR has not examined these arrangements.

Figure 6<sup>70</sup> – Campaspe River Storage System hydrographs – January 2011



70 Sourced from: Sinclair Knight Mertz Pty Ltd, *Review into the Operation of Storages During Flooding*, Victorian Floods Review, 29 September 2011, Figure 5.2, p 23

### **Recommendation 25:**

The VFR recommends that:

the state require dam owners and operators to review storage operating manuals to incorporate lessons from the 2010–11 floods and make this information publicly available. The manuals should include a clear policy on dam surcharging and pre-release.

### **Recommendation 26:**

The VFR recommends that:

the state require that dam owners and operators inform the control agency and the Bureau of Meteorology about the management and operation of dams and weirs consistent with the flood warning requirements of the relevant river systems, including providing telemetry at sites as necessary. This may require the state proactively liaising with other states to ensure equivalent obligations are placed on interstate dam operators where the dam may impact Victorian communities.

### **Recommendation 27:**

The VFR recommends that:

the state require that dam owners and operators inform people situated downstream of water storages if the owners/operators become aware of an immediate threat arising from the dam to the safety of those people. The owner/operators should provide this information as soon as the owner/operators become aware of the threat.

### **Recommendation 28:**

The VFR recommends that:

the state require dam owners and operators provide regular situational reports to the relevant control agency where dam issues may impact incident management.

## **Information gathering post floods to enhance prediction capacity**

Floods provide opportunity to collect data to update flood plans and identify gaps in flood warning systems (such as mapping and line scans). It is often the regularity of flooding that is the key to understanding flood behaviour. The collection of post flood data, such as flood extent, also provides crucial information for land use planning purposes.

Data collection activities generally centre around flood extents and depths although they do often extend to the identification of properties and assets that were flooded (along with depth). Data collected needs to include the time and height on the local reference gauge at which essential infrastructure is compromised. This includes major roads and evacuation routes as well as medical and other essential services.

The VFMS indicates DSE, CMAs and councils will undertake monitoring of flood events. CMAs typically coordinate the monitoring of significant floods within their region and make flood information available to the public. Councils are required to maintain and enhance local information and monitor significant local flood events. During the consultations some councils were advised that they were unsure whether or not the CMAs would be collecting data in urban centres. It is not unreasonable to expect that councils would collect data specific to urban systems and CMAs and DSE rural areas. However, the VFR is of the opinion that further clarity would resolve potential overlap or coordination issues.

The VFR notes the extensive data collection that followed the floods from September 2010 to February 2011. CMAs have carried out a number of data collection meetings and surveys. Some of this information included:

- Community meetings  
public meetings were held in regional locations with the specific goal to obtain as much information as possible relating to the January 2011 flood event, specifically in areas where little information was previously available
- Floor level surveys  
Commercial surveyors were engaged to record levels of inundated properties for future flood reference

- Pegging of extents

survey pegs at the high water level either during or post the event in areas throughout the region. The survey will be valuable for future reference and will increase understanding for any future flood studies

- Aerial photography

A series of aerial images were taken across the flood region to mark the extent of flood waters. Photos were used to understand flood behaviour and extent

- Linescans

Infrared aerial plan images were obtained from dedicated aircraft during the event highlighting the extent of water at specific points in time.

The CMAs raised two core issues with the VFR. While the CMAs are obligated to collect flood data, they are not necessarily funded to do so. Data collection commences almost immediately after the onset of a flood. CMAs are a service delivery organisation with funding tied to projects under contractual arrangements. Approval is required to vary contracts, which often involve Commonwealth Government or community cost sharing, to redirect funds for flood data collection. Due to the importance and time critical nature of data collection, DSE underwrote the collection of flood data undertaken by CMAs with funding to be determined at a later date. The VFR is of the opinion that the uncertainty and ad hoc arrangements for funding are undesirable and surety of funding needs to be formalised.

The ability to collect data is also dependent on available resources. The VFR was advised that due to the benign fire season resources were available to collect data (for example, aircraft used for line scanning, which was viewed as invaluable). DSE maintains aircraft contracts through the State Aircraft Unit, however, the timeframe where aircraft are typically available is limited to the fire season. The state needs to consider the availability of such resources for a range of hazards other than fire.

### Recommendation 29:

The VFR recommends that:

the state clarify which agency is responsible for collecting post-flood extent and related data. This should include:

- the development of guidelines to ensure consistent standards are applied to post-flood data collection; and
- an appropriate process to ensure funding availability for such activities.

## Statewide information management systems

The Victorian Flood Database (VFD) is a series of spatial layers depicting flood information from both actual flood events and statistical/modelled/design flood events across the state of Victoria. Some flood related infrastructure (for example, levees) is also included. DSE is the custodian of the VFD.

The primary purpose of the VFD is to consolidate, maintain and distribute spatial flood data to key users groups including the DSE, CMAs, VICSES, municipal councils and other agencies with a role in flood management and response.

The DPCD also uses the 1 in 100 year extent and floodway datasets as input into the municipal planning scheme zones and overlays, particularly the land subject to inundation and floodway overlays and urban flood zone.

The majority of the VFD originates from data captured as part of the Flood Data Transfer Project completed in 2000. This project transferred or converted most of the available flood information that had a spatial context from paper maps and plans held by various government agencies into a GIS format.

The VFD has been regularly updated since 2000 to incorporate numerous local flood studies and mapping projects carried out by councils and CMAs. Observed flood information, including surveyed observed flood marks and flood extent mapping from aerial imagery for flood events occurring since 2000, is used to update the 'historic' flood layers of the VFD.

The VFD covers all of Victoria except for the area managed by Melbourne Water, which encompasses the greater metropolitan area of Melbourne and most of the Port Phillip and Westernport CMA.



As discussed previously, there are two Commonwealth Government reviews into flood mapping with recent national discussions about the use of flood data to assess risk for insurance purposes. Potential outcomes of the reviews, in which Victoria is a participant, may require the VFD to be modified.

### Recommendation 30:

The VFR recommends that:

the state take into account any outcomes from the Commonwealth Government's flood mapping reviews in the continual development of the Victorian flood database and to incorporate into the database flood data currently held by Melbourne Water.

## Modelling and technology advances

Technical advances over the past 30 years or so have improved the capability of flood forecast and warning systems. These advances include:

- improved computing capability which has:
  - in conjunction with improved understanding and models of atmospheric processes and ocean/atmosphere interactions and increased availability of data from satellite and other observation platforms, aided the delivery of more accurate and longer period weather forecasts as well as better forecasts of the timing, location and likely depth of rainfall
  - allowed more robust hydrologic and hydraulic modelling prior to and during flood events resulting in more timely and accurate predictions of flood heights, depths and extents
  - facilitated improved data management and data sharing
  - advanced the automation and integration of processes which assists the timely delivery of forecasts and warnings
  - facilitated the timely sharing of increasing amounts of information through the internet and social networking sites
- improved communications systems which have:
  - enabled data to be communicated more quickly from the measuring site to the forecast centre (or users) using a range of techniques including radio, telephone, mobile telephone, satellite and internet (for example, Event Reporting Telemetry System (ERTS) equipment, flash flood warning systems in South Australia)
  - streamlined quick delivery of warning messages to response agencies and at risk populations and increased the complexity of the information that can be delivered as well as the way in which it is delivered
- weather radar that, combined with improved computing power, allows the better identification, tracking and scaling of localised storms and heavy rain systems that give rise to flash flooding as well as to more widespread flooding
- the development of automated rain and river level measuring equipment which has increased the availability of real time or near real time data. There are however areas in the state where low gauge densities severely compromise the delivery of an effective flood warning service (for example, the Mount Emu Creek, Hopkins River and Glenelg River catchments)
- improved river gauging equipment (for example, acoustic doppler flow measurement systems) that enable more accurate and quicker flow measurements to be made during a flood event
- more sophisticated modelling tools that better represent the physical processes occurring within the catchment and that in turn enable increased confidence in the delivery of a more accurate prediction
- airborne remote ground survey techniques (such as Light Detection and Ranging (LiDAR) technology) that enable accurate and detailed digital terrain models to be developed which, when combined with hydraulic model outputs, enable maps of likely flood inundation extents and depths to be developed for a range of possible flood events, more economically and accurately than in the past
- the availability of airborne infrared scanners, cameras and related equipment that can provide large area views of flooding extents
- GIS that enable the combination of a range of spatial information to be combined in static and dynamic form and that in turn facilitates improved understanding of likely flood impacts.

Notwithstanding these advances and the accuracy of the BoM's weather forecasts over the period, the VFR believes that the use of these and related technologies could be extended in order to further improve the TFWS.

With improvements in the forecasting of the timing, location and likely depth of rainfall, it is becoming increasingly viable to use forecast rainfalls to improve the lead time on flood forecasts. While it is acknowledged that there is still significant uncertainty associated with rainfall forecasting especially over catchment sized areas because of the difficulties associated with determining the spatial and temporal distribution of that rainfall, the VFR understands that the benefits to be gained from improving forecast and warning lead time would be substantial. The challenge will be to communicate the uncertainty inherent in the flood forecast. At the same time, there will need to be a move away from a focus on getting the forecast of the flood peak 'right' to a focus on providing increasingly accurate (i.e. zeroing in on) predictions of key information as the flood progresses contributing to the delivery of meaningful, useful and informative warnings. The VFR understands that an approximate time to exceed key critical levels can in most cases be more useful and useable if delivered with good lead time than an exact forecast of the peak level with limited lead time.

Flash floods are difficult to forecast: they generally involve small areas and happen over short timeframes. However, systems based on linked radar coverage and automated rain gauges, high resolution rainfall forecasts, antecedent and stream conditions and effective communication schemes offer some improvements (not only in relation to flash flooding but to a range of beneficiaries), albeit at a cost. Weather radar coverage in Victoria is not complete and existing radars are subject to elevation effects. The result is that there are some 'holes' in coverage. These holes can change depending on weather and other conditions. There is also a need for further research on the use of radar for rainfall assessment and prediction of areas likely to be affected by high rainfall. A technical solution to flash flooding is not likely soon and as the 2010–11 floods demonstrated, it is unlikely for some time to come that all areas at risk from flash flooding will be identified ahead of a future event. Further, the time available for response will remain short. The challenge is to not only develop the forecast capability but to also establish processes for effective response.

During the 2010–11 floods, aircraft mounted infrared aerial line scanning technology normally utilised in fire line scanning operations by the CFA and DSE, along with selected satellite scans were used within some of the ICCs. The line scans and satellite imagery provided information on the extent of flooding, including the location of significant levee breaches and other floodplain flow paths and on the movement of flood fronts and peaks. Many of the scans covered areas where there were few if any river gauging stations. The technology worked well on the wide flat floodplains of the Wimmera, lower Loddon, lower Avoca and Murray rivers where the water spread was significant and water moved slowly. While photographs from aerial reconnaissance flights provided what might be seen as similar information for discrete locations, the line scans and images were far more useful. They provided a single picture of what was a very large flooded area and by merging successive images the ICC was able to gain a solid appreciation of flood movements. This informed and assisted operational forecasting and response planning. Noted disadvantages included the time it took to process the images (in excess of 12 hours), the sensitivity of the line scan images to a warming landscape and flying hour restrictions. The technology would be less useful along steeper, more confined and faster flowing rivers. Nevertheless, the VFR recommends that more formal arrangements be established to ensure that this technology is available to ICCs as and when needed during future flood events.

Flood and related studies completed to date have delivered a range of good quality and reliable flood inundation and risk maps along with information that is pertinent to flood response. In many cases, however, the flood intelligence embedded in these maps and the associated reports has not been extracted to flood emergency plans. Further, many of the maps have not been made widely available. The VFR believes that the maps and related flood intelligence needs to be integrated with other flood data and shared with both the response agencies and those at risk. The technology exists to achieve integration and sharing. System compatibility and cost issues, however, remain as barriers to information exchange and data interoperability.

The availability of good quality digital terrain data and robust hydrologic and hydraulic models provides a strong technical environment for developing in-fill flood inundation and risk maps across the state. These maps will perform a number of functions including:

- acting to raise awareness of flooding within mapped communities
- signalling where new or expanded flood warning services are required while providing data to support arguments for investment
- assisting response agencies in identifying assets and infrastructure at risk as well as the development of flood emergency plans
- strengthening the land use planning process which aims to curb the growth of flood risk and flood related damages.

Advances in hydrologic and particularly hydraulic modelling (for example, use of 2-dimensional and nested 1-dimensional/2-dimensional models) along with increased computing capacities coupled with significant advances in remote sensing and the preparation of high resolution digital terrain models has resulted in progressive improvements in flood mapping over the past 20 or so years. However, there is no standard set of flood maps delivered by a flood or related study. The majority of maps show flood depths using a variety of depth bands, some identify high hazard areas and a limited number identify properties (including essential infrastructure) affected and buildings flooded over-floor. Generally the 100 year AEP flood extent is mapped along with a selection of more frequent floods. On occasions, the 200 year (this map was available for Horsham and was used successfully to guide response), 500 year and probable maximum floods are also mapped. Mapping for the less frequent floods and particularly for those above the 100 year AEP event is especially important. Local knowledge of the behaviour of the less frequent floods is generally limited and because the planning level is set at the 100 year AEP flood level plus an allowance for freeboard, impacts and damages tend to increase substantially. The VFR recommends the development of a standard for the production of all future flood inundation maps which includes guidance on the extraction of flood intelligence for flood response purposes.

It has been suggested to the VFR that future flood forecasts should be developed using a combined hydrologic – hydraulic model. This means that rather than comprising a forecast height (or time of exceedance of a level), the forecast would comprise a map showing the extent of likely inundation, coloured to

show depth ranges. The technology exists to produce this sort of forecast and comprises a combination of accurate ground elevation data (such as produced from LiDAR), robust and linked hydrologic and hydraulic models and internet based GIS manipulation and display tools. There is, however, a significant cost in terms of both resources and time to establish the system across the state. Further, significant effort would be required to ensure that users were able to extract the intelligence from the forecast and understand what it was telling them. This implies that either the forecast would be delivered in a variety of formats in order to reach a wide audience (and not just those with internet access) or it would be delivered in other than map format (perhaps a map accompanied by tables of assets likely to be impacted along with the depth of inundation) as well as being able to be interrogated by the GIS delivery tool. While there are obvious benefits in improving flood forecast development and delivery through the combination of available information and the delivery of some interpretation of that information in a format that is easily assimilated, the gains will only address some of the issues raised with the VFR.

The VFR notes the Victorian Government's commitment to improved flood warning systems by announcing \$12.078 million over four years for developing and implementing a web based flood intelligence platform that will combine flood warnings with flood behaviour and consequences to assess potential impacts. The platform, termed FloodZoom, is expected to greatly expand the scope, capacity and speed of providing detailed flood advice during an emergency. FloodZoom is designed to take predictions issued by the BoM, determine what they mean in terms of the extent of the flood and its possible impacts on the community, and in turn assist the control agency in issuing more timely and accurate flood warnings to the community.

DSE has advised that improvements in flood warning services will start to be seen in 2011–12, as new flood warning infrastructure becomes progressively available and regional and local information is incorporated into FloodZoom.

Technology is advancing and while many of these advances are informing and assisting the TFWS, it is apparent that, with additional resourcing and funding, technology uptake could increase. Increased uptake is likely to result in a step change in flood warning service delivery: from examples of good practice to a model of best practice.

# Chapter Two

The adequacy, timeliness and effectiveness of flood warnings and public information





## Warnings and public information

As discussed in Chapter One, the TFWS describes a range of elements which must be operating and integrated for the system to be effective in assisting agencies and at risk communities to understand and prepare for flood events and for flood warnings to support mitigation actions.

Figure 7 shows the interdependency and linkages between the essential components of TFWS. While not implicitly shown, community input is considered integral to the review process.

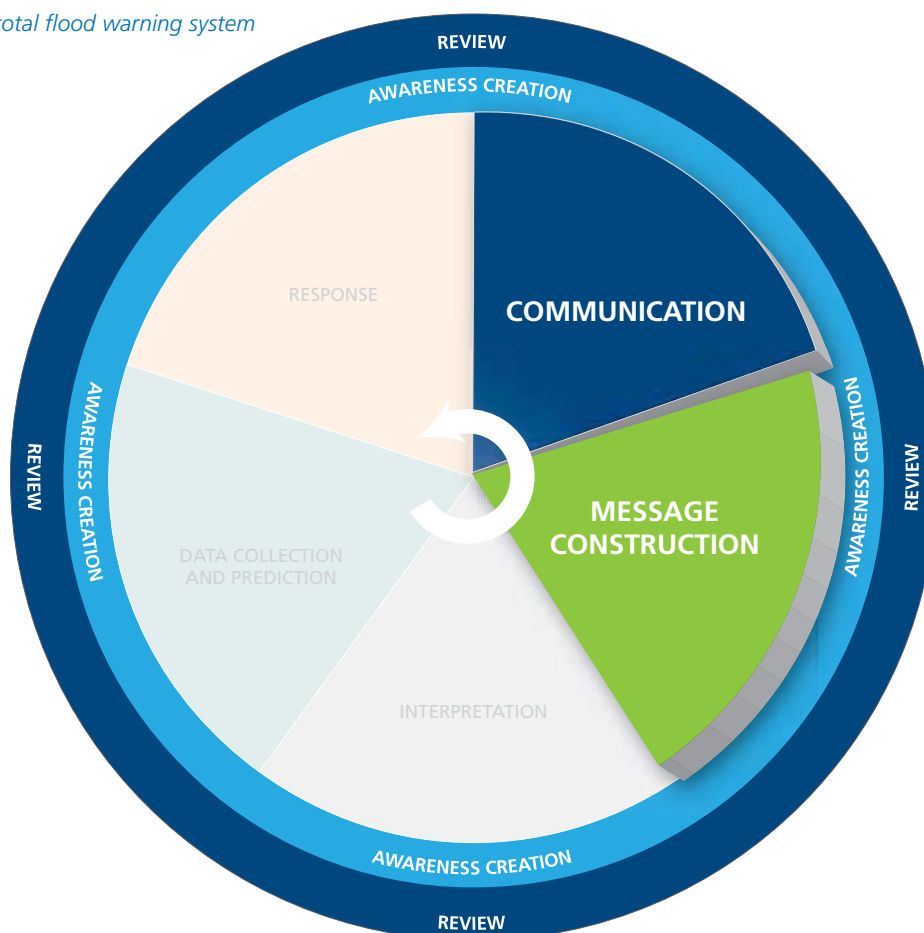
Emergency Management Australia (EMA) suggests that in Australia, the various TFWS components are developed to different degrees and one or more components may be virtually absent in some situations.

Message construction and communication were seen as usually less well developed components.<sup>71</sup> This chapter will examine those components in the context of the Victorian experience.

The VWP describes a warning as:

*...a method used by authorities to warn or inform relevant communities of an impending emergency and/or provide them with appropriate information or advice on heightened risk situations. Effective community information and warning systems are a key component in managing emergencies and can assist in preventing the loss of life as well as limiting material and economic damage.<sup>73</sup>*

Figure 7<sup>72</sup> – The total flood warning system



71 Emergency Management Australia, *Manual 21 – Flood Warning*, Attorney-General's Department, Barton, 2009, p 7

72 Adapted from: Emergency Management Australia, *Manual 21 – Flood Warning*, Attorney-General's Department, Barton, 2009

73 State Government of Victoria, *Victorian Warning Protocol*, Office of the Emergency Services Commissioner, Melbourne Version 1.0 November 2009

To assist agencies in developing and distributing warning and public information the VWP was established to provide emergency response agencies with coordinated and consistent direction on advice and warnings to communities of potential threats and actions to be taken for their safety.

The VWP was developed under the auspices of the national warning principles agreed to by the Ministerial Council for Police and Emergency Management – Emergency Management in September 2008. In accordance with these principles, a national warning process was subsequently developed.

The nine Victorian signatory agencies<sup>74</sup> were required to integrate the protocol into their agency specific emergency management practices and ensure that the warning procedures were well documented, communicated and understood by all of their relevant emergency management staff.

Emergency Warnings are intended to achieve two important outcomes; firstly to inform those at risk of an impending or current threat and secondly that appropriate actions are taken by those at risk. The warning must be "... informative and persuasive and be clearly understood by those receiving it."<sup>75</sup> In addition, to ensure the widest possible reach, warnings must be provided through a variety of sources as no one method will enable all those at risk to receive the warning in a timely fashion.

As no one method of providing a warning will reach all the intended recipients, a variety of warning methods are generally used including:

- radio
- television
- email
- telephone – voice message and short message service (SMS) or text alerts
- doorknocking
- internet including social media (such as Twitter and Facebook)
- verbal (face to face, community meetings).

Warnings must be provided early enough to enable those at risk to take appropriate action in response to the warning. In some cases, despite the best intention, plans and the desire to protect life and property, a warning will not be given. The rapid onset of unforeseen emergencies, such as a flash flood, can occur with little or no opportunity for a warning.

The language used in a warning is vital to ensure that it is clear and contains the necessary explicit action so the community is informed of the impending or current threat and there is a community response or action. Control agencies are guided by documents such as the Commonwealth Government's *Emergency Warnings – Choosing Your Words*<sup>76</sup>, the EMMV and the VWP which provide detailed information on the attributes for adequate emergency messages regardless of the emergency event.

Many warning messages are intended to encourage and prompt those at risk to seek further information. In most cases, warning recipients will be directed to websites or provided with specific contact numbers for detailed emergency information.

Much of the literature and research related to warnings emphasises the need for appropriate public information and education before, during and after emergencies. The VBRC in its *Interim Report* highlighted this need:

*The evidence before the commission has demonstrated that the community depends on (and has come to expect) detailed and high quality information prior to, during and after bushfires. In addition, the community is entitled to expect to receive timely and accurate information whenever possible, based on the intelligence available to control agencies.<sup>77</sup>*

Government and the emergency services use a range of public information and education strategies to improve community safety, increase knowledge and awareness of the risks of natural hazards and other emergency events. The main outcomes intended from a well organised and targeted public information program are increased knowledge and understanding of hazard risk and possible preparedness activities.<sup>78</sup>

74 Victorian Warning Protocol – signatory agencies: CFA, DH, DHS, DPI, DSE, MFB, VicPol, VICSES and Emergency Services Telecommunications Authority (ESTA)

75 Emergency Management Australia, *Manual 21 – Flood Warning*, Attorney-General's Department, Barton, 2009, p 39

76 Commonwealth of Australia, *Emergency Warnings – Choosing Your Words*, Attorney-General's Department, Edition 2, 2008 [www.ema.gov.au](http://www.ema.gov.au)

77 2009 Victorian Bushfires Royal Commission, *Victorian Bushfires Royal Commission Interim Report*, Parliament of Victoria, 2009, p 120

78 Emergency Management Australia, *Manual 45 – Guidelines for the Development of Community Education, Awareness & Engagement Programs*, Attorney-General's Department, Barton, 2009, p 18



To be considered effective, public information aimed at the local level should enable at risk communities to interpret warnings and allow them to make informed decisions about the necessary actions they will need to take specific to their circumstance and level of risk.

## Responsibility for flood warnings

The Commonwealth Government's *Flood Warning Manual* states that:

*Well developed flood warning services that are understood and acted upon by the communities for which they are provided can contribute significantly to saving lives and protecting property. They should be regarded as central to the management of flooding.<sup>79</sup>*

Under the state's emergency management arrangements, VICSES is the control agency for flood response and as such, is responsible for issuing warnings and public information to potentially affected communities and other agencies. The Commonwealth Government takes the lead role in the provision of flood warning services through the BoM. The BoM and Melbourne Water flood warning services provide different types of information that is dependent on the *type of flooding* and the *flood risk*.

Municipal councils also have the following responsibilities: provision of community awareness, information and warning system(s); facilitation of the delivery of warnings to communities; and the provision of information to the public and media.

### A community approach to telephone alerting – Greater Shepparton City Council

A number of towns across Victoria now have tailor-made telephone alerting systems in operation as part of flood warning systems as municipal councils seek to support the provision of information and warnings to their at risk communities.

For example, the Greater Shepparton City Council, in conjunction with the Goulburn Broken CMA, has developed and implemented a community warning and information system incorporating telephone messaging technology to provide flood alerts and advice to the targeted community at risk. The Community Telephone Alerting System (CTAS) is an important component of council's Municipal Emergency Management Plan flood sub-plan.

The alert system has the capacity to broadcast pre-recorded voice messages to any number of phones, mobile phones and answering machines simultaneously, providing the community with official emergency information. The system also enables the council to send flood-related information to residents and organisations who have agreed to have their telephone number included on the Council Early Warning Database.

The alert messages are developed based on flood intelligence extracted from past floods, study findings and predictions provided by the Bureau of Meteorology. The nature of the flood information provided may vary depending on whether the flood waters are rising or receding. In addition, residences and businesses in many towns have access to flood intelligence such as river levels at which their house and property will be inundated by floodwaters.

Despite the good intention of having all affected homes and businesses signed up to this telephone alerting system, many have not returned the required written confirmation, known as a consent to 'opt-in'.

More recent telephone alerting arrangements have adopted an 'opt-out' approach, whereby individuals are provided information kits including an opportunity to sign and return a specific form stating a desire to be excluded from telephone alerting. This approach has almost a 100 per cent success rate as compared to the opt-in approach of around 15 per cent.

During the September 2010 floods, the council sent three messages using CTAS to the 600 people registered on the Council Early Warning Database.

79 Emergency Management Australia, *Manual 21 – Flood Warning*, Attorney-General's Department, Barton, 2009, p 3

## Bureau of Meteorology warnings

As it is inevitably the weather that is a precursor to a flood event, a flood warning will commence with the agency responsible for providing the community with weather forecasts and predictions. Section 6(1)(c) of the Commonwealth *Meteorology Act 1955* prescribes one of the functions of the BoM as “the issue of warnings of gales, storms and other weather conditions likely to endanger life or property, including weather conditions likely to give rise to floods or bushfires”. This function of the BoM is also reiterated in Part 7 of the EMMV.

It is the responsibility of the BoM to maintain the service level requirements as agreed to by the VFWCC. The BoM act as the flood prediction agency for all Victorian catchments with the exception of the metropolitan Melbourne catchments (Yarra, Maribyrnong, Westernport, Dandenong Creek, Werribee) where Melbourne Water is the lead agency for flood predictions. The BoM formulate and issue official forecasts and warnings for:

- river basins (flood watches)
- key locations on rivers and creeks (flood warnings)
- weather forecast and warnings (severe weather and severe thunderstorm warnings)
- coastal areas forecasts and warnings (severe weather warning).

For the larger metropolitan Melbourne catchments, Melbourne Water operates a flood warning network on major rivers and creeks and provides information to the BoM who formulate and issue official forecasts and warnings for key locations on rivers and creeks (flood warnings).

The BoM issues warnings about the weather conditions likely to give rise to floods and the potential for and severity of the forecast floods. The warnings provide no information about the consequences for communities of flooding, apart from broadly describing the localities that may be flooded and general community actions. The BoM provides these warnings directly to emergency services, such as VICSES, government agencies and municipalities and also to media outlets who generally repeat the warnings in broadcasts.

The flood forecasts are based on an estimation of river height, streamflow, time of occurrence and duration of a flood, especially of peak flow rate, at a specified point on a waterway, usually resulting from rainfall.<sup>80</sup> The BoM uses three general categories or classes of flooding related to the size of a predicted flood event, or its magnitude: minor, moderate and major.

The BoM only provides flood warnings and regional forecasting in areas where specialised warnings systems have been installed, with the resulting watch or warning reliant on the quality of the data available. Where warning systems are not installed, a generalised flood warning is issued or advice to follow the BoM rainfall radar is provided. For further information on warnings issued by the BoM, refer to Chapter One of this report.

It should be noted that the Queensland Floods Commission of Inquiry *Interim Report* also made reference to the BoM's functions under section 6(1)(c) of the *Meteorology Act* as described previously. In addition, the *Meteorology Act* requires the BoM to give, in the public's interest, advice and information.<sup>81</sup> The Queensland Floods Commission of Inquiry is of the view that the provision of generalised weather warnings may not necessarily discharge BoM's functions under the *Meteorology Act*.<sup>82</sup> The VFR agrees with this view.

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80 State of Queensland, *Understanding Floods, Queensland Floods Science*, Engineering and Technology Panel, Office of the Queensland Chief Scientist, [www.chiefscientist.qld.gov.au/publications/understanding-floods](http://www.chiefscientist.qld.gov.au/publications/understanding-floods), 2011

81 *Meteorology Act 1955* (Cwlth) s. 6(1)(d), s.6(1)(h), s 6(2))

82 Queensland Floods Commission of Inquiry, *Interim Report*, State of Queensland, [www.floodcommission.qld.gov.au](http://www.floodcommission.qld.gov.au), August 2011, p 142

## Flood warning terminology

A **flood watch** is issued by the BoM to VICSES and other key flood response agencies, the media and the public to notify them of a potential flood threat from a developing weather situation. Flood watches are issued for specific regional areas and will contain specific weather information including expected rainfall totals, describe the current state of the catchments in question (for example, saturated or dry) and indicate the streams at risk from flooding. The primary purpose of a flood watch is to provide a “heads-up” to flood agencies and the public of developing weather situations that could lead to flooding in the days ahead.

A **flood warning** is issued by the BoM to VICSES and other key response agencies, the media, and the public. The message usually contains details that flooding is about to occur or is happening, predictions, expected impact, and can include what actions should be taken. It also contains details on when the warning was issued and will state the time that the next update can be expected. If significant changes are observed, the warning may be reissued before the scheduled time.

In areas where the BoM has installed specialised warning systems, flood warnings are categorised into ‘**Minor**’, ‘**Moderate**’ or ‘**Major**’ flooding. In these areas, the flood warning message will identify the river valley, the locations expected to be flooded, the likely severity of the flooding and when it is likely to occur.

**Minor flooding** causes inconvenience. Low lying areas next to watercourses are inundated requiring the removal of stock and equipment. Minor roads may be closed and low level bridges submerged.

**Moderate flooding**, in addition to the above, may require the evacuation of some houses. Main traffic routes may be covered. The area of inundation is substantial in rural areas.

**Major flooding**, in addition to the above, may cause inundation of extensive rural areas and appreciable urban areas. Properties and towns are likely to be isolated and major traffic routes likely to be closed. Numerous evacuations may be required.

For areas where no specialised warnings systems have been installed, a **generalised flood warning** that flooding is occurring or is expected to occur in a particular region is issued. No information on the severity of flooding or the particular location of the flooding is provided.

## Control agency for flood response – VICSES

The VWP describes how a control agency, such as VICSES for flood response, has the responsibility to issue warnings to the potentially affected community and to other agencies. Based on the intelligence provided by an official warning agency (such as the BoM) and support agencies (including DSE, CMAs and local government) and having regard to the possible impacts on communities, the control agency will consider issuing additional public information (advice bulletins and/or warnings) to at risk communities beyond the statements in the official warning agency products.<sup>83</sup>

When the BoM issues a flood watch or warning, VICSES will prepare a flood bulletin using available information or flood intelligence and provide a description of possible flood consequences and specific localised public safety advice and actions. These bulletins are distributed to the community through the media and are available from the VICSES website. The bulletins are also forwarded to other emergency services agencies.

Using available flood intelligence and information enables VICSES to determine, based upon the flood predictions, the likely impacts of flooding, what actions will need to be taken by response agencies and what information and advice should be provided to the community.

83 State Government of Victoria, *Victorian Warning Protocol*, Office of the Emergency Services Commissioner, Melbourne Version 1.0 November 2009, p 6

The urgency with which warnings need to be provided to the community is generally determined by the assessment of the likely impacts and consequences for communities and most importantly, the risk the potential flood poses to the safety and lives of community members. The urgency of the need to issue a warning will also influence the method used to provide the warning and can range from inclusion in a regular weather report through to the issuing of an EA message to individual mobile telephones and landlines.

All flood warning information issued by VICSES is published on its website [www.ses.vic.gov.au](http://www.ses.vic.gov.au).

## How warnings are issued

A consistent issue raised during the VFR community consultations and within many of the submissions received by the VFR was the matter of warnings. Criticism of warnings is consistent following many major emergencies and “great community concern has been expressed about the lack of warning provided or the inadequacy of the warnings that were promulgated.”<sup>84</sup> This concern and criticism is despite an extensive level of provision of warnings and public information during the 2010–11 floods.

During the floods, warnings and information were disseminated through methods including:

- flood and community bulletins (print and online) issued by VICSES and some councils
- VICSES Flood and Storm Information Line (telephone: 1300 842 737)
- EA telephone based warning system
- community meetings
- statewide and local television broadcasts
- radio broadcasts
- media interviews and state media briefings
- updates to agency and organisation websites including the use of social media
- newspaper advertisements
- doorknocking
- letter drops
- variable message (road) signs.

The VFR recognises the suite of messaging methods used reflects differing flood scenarios and stages of the emergency event. These will vary depending on the type of emergency, community demographics, availability of warning systems and the action required from the community. A multi-faceted warning approach is recommended to ensure maximum penetration and saturation.<sup>85</sup> As shown in figure 8, there are a number of technical and communication attributes in each warning method.

## Community expectations

There is strong evidence that some communities were highly frustrated with the lack of adequacy in warnings (content and timeliness) being provided and improvements were needed. However, there is varied opinion as to what constitutes a ‘timely and accurate’ warning in the context of the floods.

The introduction of the EA national telephone warning system, greater access to the internet, improved mobile telephone coverage, television and radio coverage has contributed to an expectation that control agencies have an increased ability to provide effective warnings and public information to the community using a range of issuing mechanisms.

During various community consultations conducted by the VFR, a number of concerns were raised about the lack of timely warnings and public information on the impending floodwaters, however the VFR also heard of many positive experiences.

The commonwealth, state and response agencies have developed a range of communication methods to disseminate public information and warnings appropriate for the nature of the emergency event and the at risk communities.

Despite the development of the telephone based warnings systems, the utilisation of the advancements in social media and internet based applications, formal arrangements with television and radio broadcasters and community engagement programs, the community has a certain expectation that the warnings will be timely, accurate and include relevant information.

It is apparent that community expectation in relation to the provision of accurate and timely flood information and warnings is relatively high.

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84 Emergency Management Australia, *Manual 51 – Towards Resilience Against Flood Risks*, Attorney-General's Department, Barton, 2010, p 41

85 State Government of Victoria, *Victorian Warning Protocol*, Office of the Emergency Services Commissioner, Melbourne Version 1.0 November 2009, p 12

Figure 8<sup>86</sup> – Pros and cons of different flood warning communication methods

	Informative	Accurate/Trustworthiness	Timeliness	Audience reach	Varying audience capacities	Reliable/Resilient	Little labour required	
								<div>Works well for this aspect</div> <div>Satisfactory for this aspect</div> <div>Limited use for this aspect</div> <div>Does not support this aspect</div> <div>Variable for this aspect</div>
Sirens/alarms								<ul style="list-style-type: none"> <li>Quick; reliable; limited information and reach, but becoming more versatile with voice and remote capabilities</li> </ul>
Text message								<ul style="list-style-type: none"> <li>Can reach wide audience very quickly; no power needed</li> <li>Less reliable for areas with poor mobile phone coverage</li> </ul>
Automated telephone								<ul style="list-style-type: none"> <li>Landlines becoming less common; people often not at home/indoors</li> </ul>
Radio message								<ul style="list-style-type: none"> <li>Electricity not required; widest reach - home, work, travelling</li> <li>Variable accuracy; requires public to be listening</li> </ul>
Television								<ul style="list-style-type: none"> <li>Electricity required; variable accuracy; limited reach; requires public to be listening</li> </ul>
Websites/social media								<ul style="list-style-type: none"> <li>Quick dissemination; becoming very widespread; capacity for images</li> <li>Electricity/internet required; variable accuracy</li> </ul>
Email								<ul style="list-style-type: none"> <li>Quick dissemination, but usually has to be actively accessed; power and telecommunication infrastructure is needed; internet required</li> </ul>
Speaker phone								<ul style="list-style-type: none"> <li>Direct, specific communication</li> <li>Requires access to flooded area; difficult to hear</li> </ul>
Doorknocking								<ul style="list-style-type: none"> <li>Direct communication; chance to ask questions; high credibility</li> <li>Resource intensive; requires access to flooded area</li> </ul>
Letterbox drop								<ul style="list-style-type: none"> <li>Ability to reach almost all audiences, but may miss youth</li> <li>Slow; requires access to flooded area</li> </ul>
Noticeboards								<ul style="list-style-type: none"> <li>Useful for roads, infrastructure and location-specific information; can be controlled remotely</li> </ul>
Print media								<ul style="list-style-type: none"> <li>Informative/detailed; ability to reach wide audience</li> <li>Time needed; variable accuracy</li> </ul>
Word of mouth								<ul style="list-style-type: none"> <li>Uses info from multiple sources; persuasive</li> <li>Variable accuracy</li> </ul>

86 State of Queensland, *Understanding Floods*, Queensland Floods Science, Engineering and Technology Panel, Office of the Queensland Chief Scientist, [www.chiefscientist.qld.gov.au/publications/understanding-floods](http://www.chiefscientist.qld.gov.au/publications/understanding-floods), 2011

While there were numerous flood warnings issued through radio, EA and other methods during these events, segments of the community may have developed an unrealistic expectation that a warning will be always be issued and in some instances, will be “tailored to their specific address”.<sup>87</sup>

In as much as a warning is intended to be provided to all those at risk, it is equally true that individuals and communities need to take responsibility to be in a position to enable them to obtain the warning. This includes taking responsibility for being aware of the general weather conditions, responding to weather cues and actively seeking information and warnings.

## Dissemination of warnings and public information during the floods

A range of warnings and public information were disseminated from September 2010 to February 2011. Types of messages issued include: flood watches, warnings and advice, notices of flash flooding, isolation, evacuation, road closure and later notices related to recovery and health.

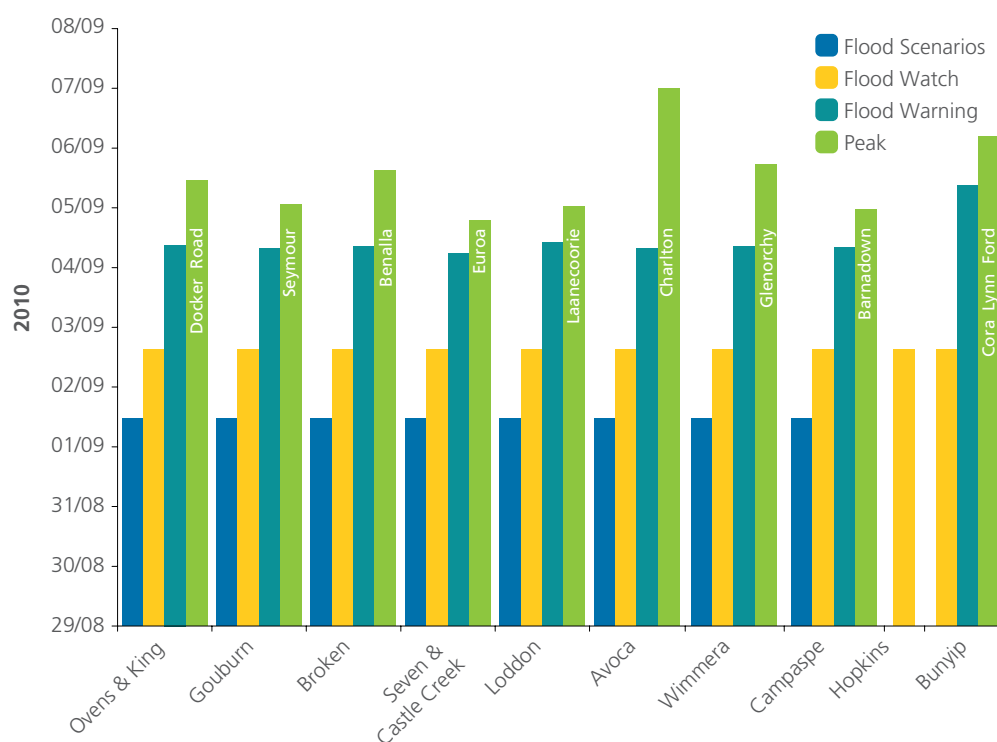
In addition, VICSES hosted community meetings, issued flood bulletins to community and media outlets, and provided information through its Flood and Storm Information Line and website.

Between September 2010 and February 2011, the BoM issued more than 1500 flood watches and warnings, including 172 major flood warnings during January 2011. In the case of predictive flooding based on the location of specialised warning systems the BoM provided flood level predictions in the north central region for six towns but in fact 25 towns were flooded.

The BoM undertook a self evaluation of some of its warning products including flood scenarios, flood watch and flood warning.<sup>88</sup> These are shown in figures 9 and 10.

Not all warnings are available in each catchment area and only selected locations were analysed. The BoM flood warnings do not provide detailed descriptions of potential flood consequences but provide only generic public safety advice statements.

Figure 9 – Timing of September 2010 flood warning products

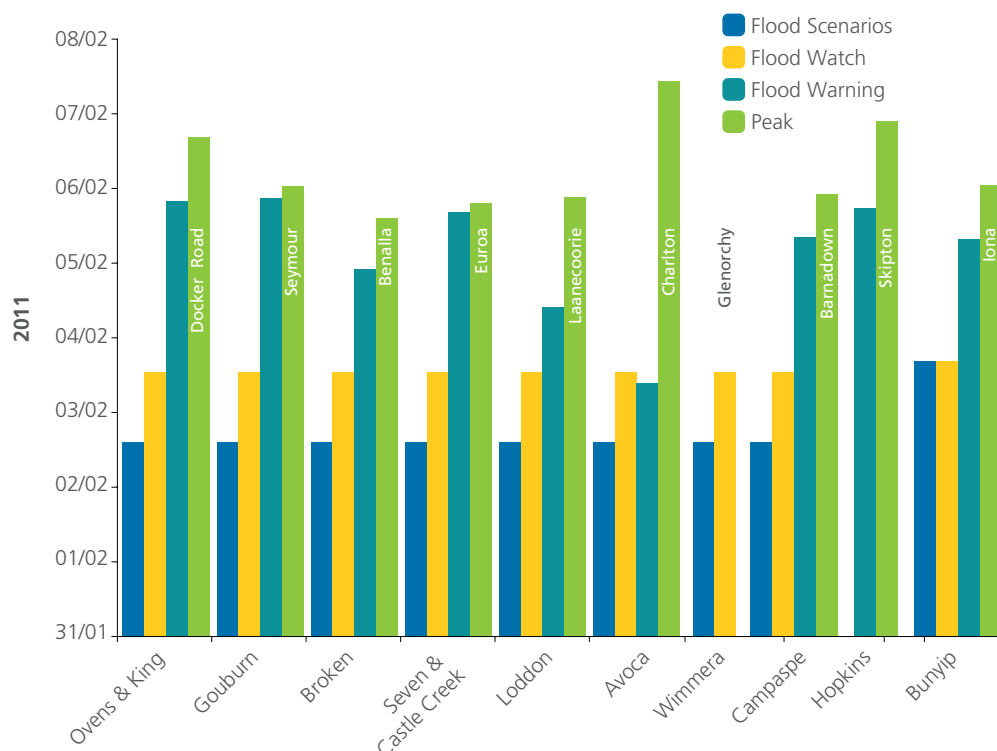


87 Molino Stewart Pty Ltd, *Examination of the Total Flood Warning System in Victoria*, 2011 Victorian Floods Review, September 2011, p 60

88 *ibid*, p 5



Figure 10 – Timing of February 2011 flood warning products



The information below summarises the method and volume of warnings and public information provided by VICSES:

- EA telephone based warning system
  - September 2010: More than 20 campaigns<sup>89</sup> resulting in messages to 152,368 individual telephones
  - January – February 2011: 76 campaigns, resulting in messages to 141,955 individual telephones (comprising 80,600 SMS alerts and 61,200 voice messages to landlines)
- Flood bulletins
  - In excess of 1000 bulletins issued to media and community outlets.
- Community meetings
  - An estimated total of 15,000 people attended approximately 150 meetings with some community meetings broadcast on radio
- The VICSES Flood and Storm Information Line (1300 VICSES or 1300 842 737)
  - activated for significant events to provide a range of information from event updates through to available financial assistance. In September, the information line received 4,399 calls and a further 16,800 calls through January and February 2011.
- The VICSES website ([www.ses.vic.gov.au](http://www.ses.vic.gov.au)) recorded 276,000 individual users in September 2010 and later in January and February 2011 recorded 544,400 users.

<sup>89</sup> A single approved message sent to multiple fixed and mobile telephone numbers in response to an event

## Flood education

*Knowing where and how to access critical information, being prepared ahead of time and taking personal responsibility for your own safety can mean the difference between experiencing a scare or living through a tragedy.<sup>90</sup>*

In its 2009 *Interim Report*, the VBRC observed that the success of (bushfire) warnings to the community partly depends on the standard of the information and education programs provided to the community prior to the issue of warnings.

The effectiveness of flood warnings is in part influenced by the level at which communities are engaged, informed and educated to the risks of the environment in which they live and accept a shared responsibility of their own risk and in partnership with emergency service organisations are prepared to undertake positive behavioural action to ensure their safety.

Integral to the acceptance of shared responsibility is an understanding individuals should not solely rely on receiving messages from agencies. Individuals should seek a range of measures to be aware of the situation around them and enact their emergency plan as is appropriate for their situation and abilities.

Over the last 30 years, a number of post flood reviews and examinations have been conducted. Evidence from such studies suggests that a common reason for the poor performance of warning systems for flood has been that those in the path of the flood have either not understood the significance of the warning or have not known how to reduce the effects of the coming flood.<sup>91</sup> Research suggests that if a community is well prepared for a flood, potential flood damage can be reduced by up to 80 per cent.<sup>92</sup>

The EMMV identifies VICSES as having responsibilities for flood response including the provision of advice, information, education, training and assistance to municipal councils, other agencies and the community in relation to emergency management principles and practices.

The VICSES flood awareness program, 'FloodSafe', was developed in 2006 based on the original New South Wales program and initially run under the 'FloodSmart' banner. The introduction of the 'FloodSafe' program initially enabled VICSES to engage with communities across the state on flood risk awareness and preparedness. The program is supported by a number of resources for households and businesses including information brochures, emergency plan toolkits and website information.

The programs are run in partnership with councils, catchment management authorities, business and community groups and other emergency services using doorknocks, media campaigns, street meetings, public meetings and direct mail outs to heighten the level of community flood awareness. VICSES has run the 'FloodSafe' program in 14 municipalities including Benalla, Wangaratta, Wellington, Maribyrnong and Cardinia.

A 2008 evaluation of the VICSES 'FloodSafe' program in Benalla showed the following results:

- residents reporting they were unprepared for floods decreased from 31 per cent to two per cent
- residents reporting they were very well or extremely well prepared for floods increased from one per cent to 34 per cent.<sup>93</sup>

The VFR's own research undertaken across flood affected communities found that the 'FloodSafe' program influenced 18.9 per cent of respondents' actions during the 2010–11 floods. While this number may appear relatively small, it is likely more indicative of the limited extent of the delivery of the 'FloodSafe' program in these areas, rather than any reflection of the program's benefits.

In some cases there appeared to be a high correlation between the levels of appropriate response to warnings and those communities that had received prior, specific ongoing community education. This was most prominent in communities in the north east of the state that had previously received prior community education and engagement programs (including in the three days prior to the floods) which were apparently 'more prepared' and 'more responsive' than those in the north west of the state who had received little or no community education and engagement.<sup>94</sup>

90 Office of the Emergency Services Commissioner, *Taking Personal Responsibility*, State of Victoria, [www.oesc.vic.gov.au](http://www.oesc.vic.gov.au)

91 Wimmera Catchment Management Authority, *Flood Warning Service Charter*, Wimmera Catchment Management Authority, [www.wcma.vic.gov.au](http://www.wcma.vic.gov.au), Version 2 15 September 2009, p 4

92 Gissing, Keys & Oppen, 'Towards resilience against flood risks', *The Australian Journal of Emergency Management*, Australian Attorney-General's Department, Vol 25, No 2, April 2010, p 40

93 Molino Stewart Pty Ltd, *Evaluation of the FloodSmart and StormSmart pilot programs and their transferability to the urban environment*. Victorian State Emergency Service and Melbourne Water, 2008

94 Molino Stewart Pty Ltd, *Examination of the Total Flood Warning System in Victoria*, 2011 Victorian Floods Review, September 2011, p 71

Community awareness and education campaigns have largely been dominated by bushfire safety messaging, particularly over the past two years following the bushfires of 2009. Bushfire education campaigns such as 'Fire Ready Victoria' and 'Prepare. Act. Survive.' are either centrally funded by government or form part of funded programs of the CFA and are delivered through a suite of mass media outlets including print, television and radio broadcasts with dedicated websites supported by print and online preparedness tools.

At some post flood community meetings and agency debriefs a number of comments were made regarding the effectiveness of community flood education. These comments included:

- better community education required, particularly about previous floods and how to prepare and respond (Bridgewater)
- holistic community education program required including for elderly, people in isolated communities (Kerang)
- community flood education capabilities of VICSES need strengthening. VICSES need to enhance community flood awareness and engage with those living in flood prone areas (Bendigo)
- the community educators from Melbourne gave a standardised presentation for each of the community presentations – sense these would have been better received if they were more localised and tailored for each community (Swan Hill).<sup>95</sup>

The development and delivery of the VICSES 'FloodSafe' programs has been in the main reliant on ad hoc funding from grants, or directly as part of individual local council initiatives in partnership with VICSES. Core funding for the 'FloodSafe' program is not part of the VICSES budget.

### Recommendation 31:

The VFR recommends that:

the state undertake a community education program to inform households of their respective flood risk. This may include information on rate notices of heights of houses above flood level and educating people about flash flooding.

### Recommendation 32:

The VFR recommends that:

the state allocate core funding for the ongoing delivery of the 'FloodSafe' program to flood prone communities across Victoria.

There is some evidence to suggest that flood education should be used to enhance current community understanding of warning systems to ensure that limitations at the local level are known. The VFR's research undertaken across flood affected areas identified that many residents (almost 40 per cent) experienced a greater direct impact than they had expected based on warnings and information received.<sup>96</sup> A similar proportion of businesses surveyed also felt the impact of the flood was far greater than outlined in flood warnings and information.

The VFR notes that within the 2011–12 state budget a funding allocation has been made to VICSES to employ a further 13 community education staff over the next three years which should enhance the ability of VICSES to engage with and inform communities about flood risks.

In addition to specific community based flood awareness programs, a range of other sources of information, resources and awareness material exists. The VICSES website contains generic flood preparedness information and awareness material including flood planning guides and information on preparing for a flood.

95 Molino Stewart Pty Ltd, *Examination of the Total Flood Warning System in Victoria*, 2011 Victorian Floods Review, September 2011, p 71

96 Strahan Research Pty Ltd, *Impact of the 2010–2011 Floods on Affected Communities Residential*, Victorian Floods Review, August 2011, p26

The websites of a number of state government agencies, emergency services and municipalities also provide online information relating to flood preparedness, with some local government websites providing information relating to the consequences and potential impact of flooding in specific areas.

A Flood Victoria website ([www.floodvictoria.vic.gov.au](http://www.floodvictoria.vic.gov.au)) has also been set up to provide links to information from a number of different government departments on the science and management of floods and how people can prepare for floods and reduce the damage caused. The Flood Victoria website was developed for the Victorian community by the Goulburn Broken CMA on behalf of the SFPC.

### A shared responsibility for floods – Rural City of Wangaratta

Wangaratta, being located at the confluence of two major rivers, periodically experiences flooding of various magnitudes with the floods of 1974 and 1993 having a devastating effect on the community.

To assist residents in the flood prone areas of the municipality, the Rural City of Wangaratta has worked with the community to develop the *Wangaratta Region FloodSafe Action Guide* and provides comprehensive information on its website ([www.wangaratta.vic.gov.au](http://www.wangaratta.vic.gov.au)) to assist residents in recognising and understanding their own individual flood risk and what different terminology means.

When the King River, Ovens River and the Fifteen Mile Creek floodwaters merge, the Wangaratta township is especially vulnerable. In addition, many areas in the region are prone to flash flooding.

The 1993 flood was the largest since records commenced in 1885 and exceeded the 1981 study design flood magnitudes of both the Ovens/King River and the One Mile Creek/Three Mile Creek systems. During the 1993 flood, 516 houses were affected by floodwater; \$962,000 damage was caused to local roads, bridges damaged and destroyed; 800 kilometres of rural fencing destroyed, with 611 cattle and 43 sheep dead.

Rural properties, to the south and east of Wangaratta were flood affected by the King River, Reedy Creek and Ovens River during major floods of 1974, 1993 and 1998.

Gauges along the Ovens River, the King River and the Fifteen Mile Creek indicate the river (floodwater) height during the stages of a flood, with gauge heights upstream often acting as warning indicators or signals for the communities downstream.

As part of the 1981 Wangaratta flood mitigation scheme, some flood affected residential properties in the Ovens and King River floodway within the township of Wangaratta were encircled by levee banks.

Residents have a responsibility to understand their own individual flood risk, to look after themselves and their neighbours and to take positive action before the flood comes. This includes the responsibility to keep themselves informed and not rely on being contacted.

Residents are encouraged to *Prepare, Act, Survive and Recover*. To support this, the website provides information including:

- **flood response guidelines definitions** describing the likely affects of minor, moderate and major flooding based on the various flood events recorded in the Ovens, King and Fifteen Mile Creek catchments in the 1993 and 1998 floods
- **characteristics of the waterways** describing catchment topography and flood effects in the Ovens, King and Fifteen Mile Creek catchments and the upper King River, upper Ovens and Buckland River catchments
- **the flood warning system** describing the rain and stream gauges comprising the Ovens River, King River and Fifteen Mile Creek data collection network and how BoM use this data as inputs to models to produce flood forecasts throughout the catchment
- **roles and responsibilities** of the community, agencies and authorities prior to, during and after flood events are clearly articulated and include contact details of key agencies.

Other websites such as Victoria Online ([www.vic.gov.au](http://www.vic.gov.au)) provide a single portal for local, state and federal government information and services including a range of preparedness, response and recovery information for different emergencies, with links to agency specific websites including VICSES, BoM, and VicRoads. An additional government website, Safety Victoria ([www.safety.vic.gov.au](http://www.safety.vic.gov.au)) provides information from a number of departments and organisations and offers general safety, hazard specific and emergency information.

It is clear there is a wealth of information available through numerous websites for a range of emergencies, including flood. The VFR believes that while it is important that departments and agencies provide information on their websites specific to their areas of responsibility, a single whole of government 'all hazards' website (or portal) should be promoted as the single source for information before, during and after emergencies. As highlighted elsewhere in this report, with many emergency warnings directing recipients to seek further information, a single common website with more detailed information would be beneficial.

As internet accessibility and affordability grows, coupled with the prevalence of web ready mobile telephones, online information asserts its presence as a valuable and expected source of information and warnings. While emergency events by their nature may be unpredictable, it is essential that emergency services have the capacity and technical capability to provide reliable, timely and accurate information and practical advice. Further information is provided in the section on social media later in this chapter.

The BRCIM *Delivery Report* suggested the state investigate considering establishing a single portal for fire safety information, with an 'all hazards, all agencies' context.<sup>97</sup> The provision of a single emergency portal would contribute to the ease of access to information in a range of formats consistent with the diversity of Victorian communities and the enhancement of community awareness in their own safety planning and response. A web address with broad recall, such as [www.emergency.vic.gov.au](http://www.emergency.vic.gov.au) (currently redirecting to [www.safety.vic.gov.au](http://www.safety.vic.gov.au)) would complement ease of access.

This web portal would ensure the community has a 'one stop' portal to access all types of information required to prepare for, respond to and recover from emergencies. The portal could also contain appropriate links to information hosted by specific agencies.

An example of a web portal approach is demonstrated by Queensland Disaster Management ([www.disaster.qld.gov.au](http://www.disaster.qld.gov.au)). This portal provides links to information and administrative forms which can be downloaded to help individuals and businesses prepare for, respond to and recover from disasters.

### Recommendation 33:

The VFR recommends that:

The state develop and implement a single web portal as a means of providing emergency information to communities and local government on an 'all hazards' basis, including the information referred to in recommendations 74, 89 and 92.

## Emergency Alert – telephone based warning system

The EA telephone based warning system is used by emergency services to send alerts to a defined area at one point in time via landline telephones and mobile telephones based on the billing address. The development of EA was in response to the events of the 2009 Victorian bushfires.

The COAG took steps to enhance the country's emergency management arrangements through the development of a telephone based emergency warning system and the Victorian Government was invited to lead the project. The national EA system became operational on 1 December 2009.

Currently, the alerts are written (SMS to mobiles) and spoken (voice message to landlines) in English. For messages to landlines, the Standard Emergency Warning Signal precedes a recorded message. If unanswered after 45 seconds the system will assume 'no answer' and will attempt to deliver the message a further two times. Due to a technical issue, there is no guarantee that messages can be left on answering machines and there is currently no call back option. People who are deaf, have a hearing or speech impediment may use a TTY (also known as a teletypewriter or a text telephone) service. The TTY service does not currently support the EA system.

97 Bushfires Royal Commission Implementation Monitor, *Delivery Report*, State of Victoria, Melbourne, March 2010

For SMS alerts, the length of the message is restricted to 160 characters. This ensures that each SMS alert will be sent as a single message to a recipient. The EA system may be impacted when a high volume of text messages are being sent and the capacity of the network is significantly reduced. This may occur on key dates such as New Year's Eve, Christmas day or during an existing emergency event where the demand on the network is significant.

The Commonwealth Government is funding the second phase of the EA project which will enable warnings to be sent to mobile telephones based on the location of the handset at the time of the emergency. This capability is referred to as the location based solution (LBS) and involves:

- the design of technical, legal and commercial requirements by Victoria in consultation with all jurisdictions
- development and implementation of the LBS capability by the carriers
- the integration of the LBS capability into EA.

## Use of Emergency Alert during the floods

The use of the EA telephone warning system was extensive during the flood events with over 320,000 messages sent. Evidence gathered from community consultation, municipality engagement and a telephone survey of residents in affected flood areas indicated that in the majority of cases, community feedback reflected appreciation of the EA system.

Control agencies that are responsible for issuing warnings through EA should adhere to an established set of guidelines. The VWP, referred to earlier, provides guidance on a number of factors including considerations, utilisation and message construction of warnings. The VWP also provides that, agencies should not solely rely on the telephony based dissemination method for community warnings.<sup>98</sup>

The VFR has discovered that at times, inappropriate use of EA by the control agency diminished the effectiveness of the warning system and in part, may have reduced community confidence in the credibility of the warning messages.

To inform the community of a public meeting in the shire of Campaspe, EAs were sent. However, only part of the population received these alerts as the transmission was commenced too late to complete all the messages before the meeting. Many people only heard of the meeting by word of mouth.

Further, EAs given during the event relating to evacuation points were often incomplete or inaccurate. Incomplete because they did not include, for example, the evacuation points on both sides of the Campaspe River, and inaccurate because the locations mentioned were incorrect. These issues could have been avoided if the messages had been checked locally before transmittal.

Of particular concern is that at times the use of EA appears to be inconsistent with agreed and established operating protocols. For example, in some areas the system was used to disseminate non-warning information, such as a public meeting, for one event but not used for the same purpose for a later event in the same area and vice versa. The VFR believes inconsistent application of the EA system during the flood events has created a perception among the community that public information should be made available in those EA message details.

*We were advised of a subsequent meeting through mobile telephone and landline system. Why wasn't this system used for the first meeting? (Rochester resident)*

Not only did this situation set a precedent for the dissemination of public information, it also added to the confusion about the intended use of the EA to recipients. This example of the use of EA is also inconsistent with SOPs as:

*The overuse of EA can diminish its effectiveness. EA is not intended for use as an alert for general news, editorial comment or the dissemination of general emergency preparedness messages.<sup>99</sup>*

<sup>98</sup> State Government of Victoria, *Victorian Warning Protocol*, Office of the Emergency Services Commissioner, Melbourne, Version 1.0 November 2009, p 25

<sup>99</sup> Victoria State Emergency Service, *Standard Operating Procedure, Use of Emergency Alert*, SOP 057



The VWP also provides advice on the possible implications on the overuse of the EA system. The VWP states that:

*Agencies should not overuse the telephony system as this could lead to the community developing a level of complacency towards receiving a telephone warning.*<sup>100</sup>

The issue of inconsistent application of EA has not only resulted in heightened community expectations on receiving information, but has placed an unachievable expectation on the system. This community expectation significantly exceeds the original intent and design of EA. While EA is considered an effective alerting tool, it does not have the capacity to deliver detailed warning information and messages. There may be some pressure by agencies to use EA as it is a new technology but this may in turn lead to overuse and if not used to warn of imminent dangers that provide specific and targeted information, then its credibility may diminish.<sup>101</sup>

Observations made by agency representatives in relation to the use of EA during the floods include<sup>102</sup>:

- some people were expecting an EA and because they weren't warned by that means they did not respond
- people don't understand that it is based on billing address
- has much better coverage than other means and get immediate feedback on how many people are receiving it
- some people were warned because they would be isolated rather than flooded but they did not necessarily understand this

Although EA has the potential to simultaneously reach a large audience (second to radio), the timeliness and adequacy of EA messaging can be constrained by volume/mobile telephone carrier traffic which may result in the same message being received at different times across the same area. Reliability of the delivery of warnings is also dependent on electricity supply and mobile coverage. It should also be noted that the lack of access to flood intelligence in some cases lead to inaccuracies and the timeliness of the messages. The inappropriate timing and content of messages may leave little notice for preparedness and may exacerbate existing levels of stress.

*Saturday night at 7pm, there was a telephone evacuation message to relocate to Cohuna to the relief centre. No information could be obtained from the telephone number on the message. I was told to make an 'informed decision' about evacuating but no information could be given. (Kerang resident)*

*Emergency Alerts were sent out to the community. These were non-specific asking people to evacuate low-lying areas and caused significant confusion as most of Echuca is low lying. (Shire of Campaspe)*

Table 3 shows the success rate of SMS (text) alerts and landline telephone messages sent using EA during the September 2010 and the January and February 2011 floods. The following factors can affect the success of EA message receipt: the mobile number is not active or has been disconnected; the mobile phone is not switched on; the mobile is not in range or its message inbox was full. Success rates to landline phone may be influenced by factors relating to availability of people at home (phone line engaged or unanswered) or the service to the line being temporarily disconnected. In addition, in some instances service congestion and multiple campaigns running in parallel may also reduce effectiveness of a campaign.

*Table 3: Success rates of EA during September 2010 and the January/February 2011 floods.*<sup>103</sup>

Type	# Sent	# Received	Success (%)
2010 Text	5,727	3,696	64.54
2010 Phone	3,635	2,666	73.34
2011 Text	80,685	49,487	63.34
2011 Phone	61,270	34,596	61.56

100 Op. cit

101 Molino Stewart Pty Ltd, *Examination of the Total Flood Warning System in Victoria*, 2011 Victorian Floods Review, September 2011 p 65

102 ibid

103 ibid

The rate of success with the use of EA is comparable with those recorded for other emergency events such as the Tostaree fire in Victoria in February 2011.<sup>104</sup> The VFR's research across flood affected residents shows that of those who received an EA message, 85 per cent remembered responding immediately to the message, 72 per cent remembered the content of the message and 54 per cent felt that the EA message assisted them in implementing their emergency plan.

The VFR notes the following observation made in a recent evaluation report of the assessment of EA:

*EA is a 'system within a system' and its effectiveness is dependent on: (1) the suitability and rigour of community preparedness; (2) the quality of the information available to EA operators prior to issuing an alert/warning; (3) the ability to predict the consequences of alert/warnings and (4) real time closure of a disruptive events.*<sup>105</sup>

The VFR believes further education is required to enhance agency and community understanding of the functioning of the current system and may help to redress unrealistic expectations of receiving an EA warning.

The VFR also found the authorising process for EA usage differed across agencies. A CFA incident controller is authorised to utilise EA without recourse to any higher levels of authority. While CFA officers acting in flood incident controller roles could utilise EA, VICSES incident controllers were of the belief that they did not have such autonomy and had to first seek state level authorisation.

On several occasions, the VFR heard that the VICSES EA authorising process led to delays in the issuing of EA messaging. The VFR was also alerted to instances of state level involvement resulting in footprint boundary changes for the intended EA messaging.

VICSES requirements for state level authorisation for EA usage added an additional layer of confusion to personnel seconded from other agencies in VICSES ICC roles. The VFR believes standardising of authorising requirements and EA usage applications across agencies should occur.

#### Recommendation 34:

The VFR recommends that:

the state develop and implement standards for Emergency Alert to ensure consistent use, training and application by accredited operators within agencies across 'all hazards'.

#### Recommendation 35:

The VFR recommends that:

the state require that agencies operate in compliance with the guidelines of the Victorian Warning Protocol to ensure efficacy of warning messages.

#### Recommendation 36:

The VFR recommends that:

the state put in place appropriate measures to inform the community of the intended purpose of the Emergency Alert warning system.

### Recognising diversity of warning recipients

Victoria's diverse community presents a number of issues for emergency service agencies in developing and delivering flood education, public information and emergency warnings. The VWP provides that where possible, warnings should not only be simple, brief and issued through a range of methods, but should consider the differing communication needs of communities. Therefore both the construction and dissemination of warnings should consider:

- culturally and linguistically diverse (CALD) individuals
- hearing impaired individuals
- vision impaired individuals.

<sup>104</sup> ibid

<sup>105</sup> Torrens Resilience Institute, Evaluation of the *Emergency Alert System – Pilot Evaluation Report (Victoria)*, Commonwealth of Australia, May 2011, p 2

At the 2006 Census, the total population of Victoria was 4.932 million, with 24 per cent born overseas in more than 200 countries. Around 74 per cent (865,826 persons) of the overseas born are from non-English speaking countries and of this population, 37 per cent (313,469) are aged 55 years and above, compared to 25 per cent for the total Victorian population. In 2006, 20 per cent (1,007,435) of Victorians spoke a language other than English at home, with over 200 languages and dialects spoken; of this demographic, 19 per cent (186,768) did not speak English well or at all.

Included in the state's diverse community are people with a disability who comprise an estimated one-fifth or almost 20 per cent of the population. There are many types of disabilities including intellectual, physical, sensory, psychiatric and neurological impairment, some which may have been caused by illness, accident or genetic disorders.

The Victorian Government's *External Communications Access Policy* sets out requirements for Victorian Government departments in respect to making their communications more accessible to people with a disability, to ensure that emergency communications can be effectively disseminated to meet the needs of people with a disability, where such activity falls within their sphere of responsibility.<sup>106</sup> While currently not directly applicable to government agencies, such as VICSES, the policy addresses the government's recognition and commitment to diverse community needs.

In addition, the *Guide to Closed Captions* provides direction for Victorian government departments and agencies regarding the use of closed captioning for the hearing impaired in the production of all government television commercials.

Closed captioning refers to the encoding of a written script displayed like a subtitle in audio-visual material in order to make it accessible to individuals with a hearing impairment.

The comprehension of warning messages and public information is challenged by the lack of information available to communities with hearing impairments (one in six people in Australia has a hearing loss) and to those with speech impediments seeking further information. Television broadcast of media briefings held by Premier of Queensland Anna Bligh during the Queensland flood events included the presence of an Auslan interpreter. Not only did this provide a necessary and practical communication of safety information for the hearing impaired communities but also served as a very visual reminder that emergencies and the requirement for safety information is not discriminatory.

The VFR is of the understanding that an Auslan interpreter was initially provided for Victorian statewide media briefings but was cut from the broadcast vision thereby excluding hearing impaired communities from accessing this outlet of vital safety information. However, VICSES hosted the footage online, which included vision of the Auslan interpreter.

The current arrangements described through the state's MOUs with emergency broadcasters do not provide for the use of captioning (but does include use, where possible, of news tickers or crawlers for television broadcasts) or Auslan interpreters with television broadcasts. For further details on emergency broadcasters refer to the section titled 'broadcasting of warnings' later in this chapter.

Through community feedback and operational debriefs the VFR was made aware of concerns that warnings and public information was initially only offered in written (and spoken) English to accommodate the majority of recipients. Concern was also raised regarding warning outlying Aboriginal communities specifically in the Bendigo and Swan Hill districts. In other cases, the translation of material caused significant delays and CALD communities were not given warning information for several hours.<sup>107</sup>

*Need better links and processes for warning those at greatest risk. Interim arrangements do not go far enough and much more needs to be done, particularly when a short notice late stage evacuation may prove necessary. Have many in the Koori community living along the river in the Swan Hill area and have doubts about our ability to provide information and messaging to them. (Wangaratta)*

*Need to go and talk with CALD communities in rural areas, for example, fruit pickers.*<sup>108</sup>

In response, VICSES 'FloodSafe' information was translated into more than 30 languages and made available in both print and audio formats eliminating literacy concerns that may have existed with people having difficulty reading their own language. The information could be accessed from the VICSES website and was provided locally through posters and fact sheets. The VFR also understands VICSES worked with local government to identify and communicate with CALD groups in at risk locations during the flood events.

106 Department of Premier and Cabinet, *External Communications Access Policy*, State of Victoria, 2006

107 Molino Stewart Pty Ltd, *Examination of the Total Flood Warning System in Victoria*, 2011 Victorian Floods Review, September 2011 p 64

108 ibid

Additionally, VICSES has received funding through the NDRGS to develop a CALD community education strategy which will be piloted through its partnership with Melbourne Water.

Research undertaken by the VFR further asserted the need for information to be available in a language other than English, with one in eight respondents (13 per cent) from metropolitan Melbourne stating the need to have emergency information in a language other than English, with an overall regional and metropolitan response of one in thirty respondents (3 per cent) needing information in a language other than English.

*The English speaking people of Swan Hill were fully informed every step of the way using the official emergency broadcasters. I felt that to tell the CALD people to listen to the radio was almost futile to most ...the parents would have asked their children to do the listening and to translate to them. This was an emergency where the parents would have been protecting the children from the potential trauma and drama.*

*The best way for CALD communities to understand fully the warnings and instructions by the authorities during an emergency is by radio broadcast as is done for English speaking people. (Swan Hill resident)*

Again, current arrangements described through the state's MOUs with emergency broadcasters do not provide for the provision of emergency warnings in languages other than English. However, Victoria has signed emergency broadcasting agreements with five community broadcasters, some of whom have both general and multilingual programming.

This discussion on access to information for CALD communities further highlights the requirement that the same message must be made available, consistently and accurately across other warning outlets. This also has implications for the reach of EA, the use of Triple Zero (000), the VICSES emergency number and the VICSES Flood and Storm Information line for those with hearing, sight and speech challenges.

In addition, research and anecdotal evidence suggests that the take up of a message is also affected by the comprehension of the information (language/translation), the appreciation of a person's own capabilities and requirements and their ability to act and previous life experiences and/or education of emergency events. It is therefore essential for agencies to ensure community education programs, such as 'FloodSafe', are accessible to the community, including CALD communities and disability groups.

Just as sending one message via many outlets will assist in spreading that message to as many at risk community members as possible, sending one message through a variety of translations is also important to ensure the reach of a message across the diversity of communities within an at risk area. The challenge for emergency service agencies is not only to improve the capability to provide timely and accurate warnings and information in English, but also to ensure Victoria's diverse communities have equal access to the same information.

### Recommendation 37:

The VFR recommends that:

the state develop a standard approach to the provision of emergency warnings and information in formats – spoken and written – that recognise diverse community needs, including language and disability.

### Recommendation 38:

The VFR recommends that:

the state engage with local government to ensure emergency services' public information and warnings reflect the community demographic.

## Community meetings

Community meetings play a pivotal role in disseminating information and providing advice to the local community. Community meetings create an informative environment where access to agency and community leaders and the distribution of information can occur in a non-threatening environment. A community meeting is also an important forum for validating information.

During the floods, approximately 150 community meetings were conducted in various parts of the state with an estimated 15,000 people attending. These community meetings provided an opportunity for local community members to discuss emerging issues with response and recovery agencies.

The VFR is aware of a strong community desire to be actively involved in these meetings but some submissions received by the VFR suggest further planning and preparation is required by the facilitator or agency conducting the meetings.

*Community meetings are the most efficient and effective means of warning where time permits because it becomes a two way conversation which is true communication. You know what people are feeling and can address their issues and questions.*<sup>109</sup>

Community meetings in general worked well across the state as they were an opportunity for broader warnings to be tailored to local situations with agency representatives available to discuss particular community concerns. In some cases, the use of a “virtual meeting” where community meetings were broadcast live on ABC and on some local commercial radio stations was another useful mechanism in ensuring that members of the community that could not attend a community meeting could still hear the discussion.<sup>110</sup>

The VFR was informed that on occasions, the community found there was adequate verbal information supplied but inadequate material/printed copies of information and instructions available to take away from the meeting. In another meeting the issue of appropriate presenters was raised, and it was suggested that the person delivering the key messages should be a local person in charge and not a council representative or politician.

*They (flood maps) can be taken to community meetings but they are only right at that point in time and we could not get an update to them. (This happened at Rochester where the community was given a flood map corresponding to the BoM forecast peak on the Friday which was exceeded by 0.5 metre on the Saturday.)”*<sup>111</sup>

In addition, many of the public submissions highlighted the apparent lack of notification of community meetings. A number of submissions referred to community members being unaware of meetings and only finding out about these meetings through word of mouth.

## Use of local knowledge

As discussed in Chapter One, the VFR received overwhelming evidence on the importance of incorporating and utilising ‘local knowledge’ into preparing and responding to floods. During the course of community consultations at Pakenham, Carisbrook, Moyhu, Rochester, Skipton, Stawell and Swan Hill the VFR heard comments relating to the importance of incorporating ‘local knowledge’ into the decision making process. It was considered by many that local knowledge should be used in the development of flood warnings including to verify information used in official messages such as warnings and evacuation notices.

At a number of community consultations, the VFR was informed of the willingness of communities to be active participants in emergency preparedness and where possible, contribute to their own community response to the flood events. Some community members were unhappy that influential members of flood prone communities with sound knowledge of flood consequence were not able to raise significant issues and their views were not taken into account by the relevant authorities when issuing warnings.

### Kerang

Decisions were being made by people from out of town with no experience rather than our very knowledgeable locals. All emergency services should have plans that incorporate local knowledge that people are aware of and that don’t overlap.

On several occasions I have been able to tap into locals who have been willing to provide updated information to the ICC. One example was a member of the public at Hexham along the Hopkins River during January 11. On another occasion one landowner in the upper reaches of the Glenelg kept us informed via Glenelg Hopkins CMA of flooding with comparisons to historical levels. (VICSES)

### Kotupna

Local knowledge should also be used. No two floods are the same and experienced local knowledge can often benefit SES in decisions.

109 ibid, p 65

110 ibid, p 66

111 ibid, p 54

The VFR views the use of available local knowledge as a relatively untapped planning and intelligence resource that can be used by a control agency in the preparation and response phase of the emergency.

The sources of local knowledge may include but are not limited to local flood wardens, local gauge wardens, local volunteer VICSES units, local landholders and community members that have had long tenure in the district, other local emergency services and community meetings where local knowledge can be shared with control agencies and other members in the community.

### Charlton

There needs to be one person in charge of the flood response who is known to the whole community.

### Kerang

We need flood wardens in the smaller areas. We forget about this after 14 years of drought. We haven't got contact people with the Shire any more – reinstating the flood warden system would do this.

In the case of utilising local knowledge during the floods, VICSES provided the VFR with a number of examples where this did occur and proved successful in either keeping the community properly informed or providing valuable information to the incident controller.

### VICSES spokesperson

Wangaratta ICC nominated a person as a core role/function with a tabard saying 'Local Knowledge' and was introduced as such at shift changeover. At Wangaratta, this was a retired shire engineer with widespread knowledge across the north east. Having a local knowledge person was critical for the proof reading of the community newsletter.

### Senior operational VICSES spokesperson

My experiences are that we have utilised local knowledge to support decision making where possible and some examples are as follows:

**Gauge readers** – Glenelg Hopkins Catchment Management Authority (GHCMA) provide excellent information gathered through farmers who perform gauge readings on behalf of the GHCMA.

**Flood wardens** – On numerous occasions flood wardens have been used to provide real time info and knowledge on flooding patterns on river systems.

**Local landowners/community members** – On several occasions, I have been able to tap into locals who have been willing to provide updated information to the ICC.

**Local CFA brigades** have often been utilised in communities where SES does not have a presence.

**Local government** is used regularly in the provision of their knowledge and records on flooding history and dynamics.

**Expert advice** – We cannot ignore that often our decision making is based on expert advice provided through agencies such as CMAs and water authorities.



It is apparent from submissions to the VFR and evidence gathered in the consultative process that community members want local input and local representation during these types of events. In many cases, communities felt the ability for them to provide local knowledge and observations, such as river levels and levee conditions, to emergency services agencies was challenging and often dismissed.

The VFR is however mindful that the basis of local knowledge is largely limited to previous events. The value and accuracy of local information can be highly variable and therefore must be assessed and validated as to its accuracy. If a flood event is larger than previously experienced, local knowledge may struggle to predict the potential flood consequences. In regional communities where landholders have traditionally held the historical knowledge of flooding events and river patterns, the VFR is aware that verification of information issued by agencies was common practice.

Following major bushfires in 2002–03 and to reduce the load on the emergency Triple Zero (000) service, the Victorian Government initiated a service for people seeking bushfire information and advice – the Victorian Bushfire Information Line. In the case of floods and storms the VICSES Flood and Storm Information Line provides information to local communities during these events. Both these information lines are operated by the same call centre facility.

At the 11 November 2011 meeting of the Standing Council on Police and Emergency Management, police and emergency management ministers from Australia and New Zealand agreed to work towards setting up an ‘all hazards’ emergency information hotline to provide a single number to call for information about floods, bushfires and other serious events.

The Flood and Storm Information Line does not enable the community to provide information back to VICSES on the status of the flooding consequences and impact at the local level. Potentially the Flood and Storm Information Line could be refined to allow operators to collect local information when it is provided, and pass this onto relevant ICCs.<sup>112</sup> The VFR is of the view that this should be investigated.

The VFR understands that the VICSES Emergency Assistance line was used on several occasions to inform VICSES of emerging issues. While this information was used as part of the process of building the intelligence picture, this was a reactionary rather than a consultative approach.

The issue of local input into emergency management is discussed in more detail in Chapter Eight of this report.

### Recommendation 39:

The VFR recommends that:

the state investigate the ability to refine the Flood and Storm Information Line to enable it to receive as well as provide information.

## Broadcasting of warnings

Victoria has established a number of formal arrangements with radio and television broadcasters to assist emergency service agencies issue emergency information and warnings and to provide communities with greater access to information and warnings.

Radio is one of the most regularly used warning methods in Australia with the potential ability to reach large numbers of people in diverse geographical locations with complex information in short timeframes. Even if power is lost, broadcast can still be accessed through battery-powered radio, car radios, some digital audio players such as MP3s or many mobile telephones.

When an emergency service agency issues a warning through EA, the agency will email emergency broadcasters with the EA message and the time and date it was issued. In addition to relaying emergency warnings, broadcasters provided information ranging from road closures, flood safety and health messages, sandbag information, details of relief and recovery centres, interviews with emergency services personnel and talkback with locals. Many broadcasters complemented their broadcasts by publishing emergency information on their websites.

In addition to dissemination of emergency warnings released by emergency services, media outlets broadcast weather forecast information issued by the BoM.

From research undertaken by the VFR, two dominant sources of information on the flood threat prior to the floods were evident, with more than 39 per cent of respondents identifying television and more than 36 per cent of respondents identifying radio as a source of information in addition to that provided by emergency services. From the same research, radio rather than television was preferred in regional areas, with metropolitan respondents citing television as their preferred information source.

<sup>112</sup> For further details on ICCs refer to Chapter Three in this report

Since the VBRC recommendations to strengthen the provision of state based warning systems, the arrangement for emergency broadcasting has been expanded from the formal agreement with the ABC in 2004. These arrangements now include agreements with approximately 30 commercial radio broadcasters, six community radio stations, Sky News television and a revised agreement with the ABC (to include distribution of warnings via ABC local radio). The arrangements are set out in MOUs that affirm the “recognition of the vital importance of timely, accurate warnings to protect human life during emergency events”. Copies of the MOUs are available from the OESC website at [www.oesc.vic.gov.au](http://www.oesc.vic.gov.au).

The MOUs provide for the broadcaster to “commit to broadcasting emergency messages in the agreed form provided by the emergency services (referred to as control agencies in the MOUs) in a timely manner, in order to notify listeners that a significant emergency is occurring in their area and if necessary, interrupt normal programming to deliver messages”. The procedures outlined in the MOUs are all hazards procedures and therefore applicable to a wide range of emergency events including fires, terrorist incidents and floods. A practice note has also been developed by OESC to assist broadcasters and the emergency service agencies to implement the procedures outlined in the MOU.

The practice note outlines that in the event of an emergency, the authorised emergency service representative will determine if a warning is to be sent to all media in a designated emergency impact area. The authorised emergency service representative will then communicate the warning to the broadcaster through email, an initial SMS or telephone call to alert them to expect emails containing warnings. Broadcasters may receive flood related warnings under one of five categories, which dictate when the warning should be broadcast in the station’s programming.

During the 2010–11 floods, in addition to broadcasting emergency information, some local radio stations broadcast proceedings of community meetings, allowing greater community access to information for those unable to attend. At the height of the floods each VICSES region provided live to air updates three times a day which included key messages and concerns. ABC would then upload these to its Facebook page. This information was accessed more than 8,000 times during the event(s).<sup>113</sup>

The VFR understands these broadcasts were appreciated by at risk communities.

*Live radio broadcasts of flood information sessions in our region was a great initiative and should be continued and expanded.*

*The ABC coverage was pretty good but didn’t have the local knowledge of the local stations. 3SH took the initiative and came to the meetings, and allotted regular timeslots throughout the day for the mayor and the incident controller.*

*Local radio station 3SH and MIXFM – great information, accurate, no nonsense, gave the actual areas (not just Swan Hill). Interviews with relevant people twice daily. Combined the two stations to broadcast those messages. Locals attending the meetings were broadcast on the 3SH coverage. Coverage started quite early – by mid January, after the first community meeting.*

Feedback received through the VFR community consultative processes and VFR submissions confirmed a heavy reliance on radio broadcasts for warnings and public information but also highlighted the vulnerability of these services as they are reliant on the strength of information being provided to them for broadcast.

*We at Newbridge had no idea of the level of flooding that was to come. We were told via ABC radio that there would be major flooding but that was it.*

*ABC flood watch and warnings – accurate, in conjunction with BoM and watching the river.*

*Good warnings (on the ABC and from the BoM) – plenty of time to move livestock*

*The radio did broadcast reports from others which were inaccurate – the radio coverage was good, but only as good as the content they were given.*

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<sup>113</sup> Victoria State Emergency Service, *Communication Strategies during the floods of January and February 2011*, presentation, June 2011

In addition, it is noted that coverage of one radio station frequency (the station's broadcast footprint) may reach many flood affected locations at the same time. In a large scale event, this may impact on the timeliness of information and warnings relevant to the listener.

*The format needs to be improved – people don't have time in emergency situations to listen to waffle to find out if their area is affected. There should be a set time that concise information is broadcast for items such as road closures due to flood, fire, etcetera.*

Many people rely on broadcasters as trusted sources of information and thus maintaining content accuracy is critical in securing the trust of communities in the information they are provided.

*In times of emergency, there is a need for organisations (such as VicRoads and SES) to be responsible for the information they provide to the public, for example, by interviews given to the ABC emergency radio. The incorrect information given to ABC radio caused much unneeded traffic redirections... ABC radio as the main information source for emergencies must also bear some responsibility for broadcasting incorrect information. They must establish a system of independent corroboration of facts provided by people such as VicRoads and SES spokespersons.*

*In some cases rumours (inaccurate) were reported on local radio in the absence of timely information from official sources. Accurate information needs to be released in a timely and targeted fashion and misinformation needs to be countered quickly.*

While the MOU is not legally binding, signatories agree that best endeavours will be made to ensure the accuracy of information being broadcast during an emergency by spokespeople other than a control agency. Where emergency events are changing at speed, the ability for emergency services to quickly correct broadcast or internet published information is a priority. The ability to foster an agile emergency service environment may require the adoption of communication practices and technologies such as social media, that may challenge the established processes which currently exist in the command and control structures of emergency services organisations.

#### Recommendation 40:

The VFR recommends that:

the state review its Memoranda of Understanding with official emergency broadcasters to take account of increased usage of internet based information, including social media and the ability to broadcast community meetings.

## Use of social media

Social media consists of internet tools that enable exchange of information through conversation and interaction.<sup>114</sup> An estimated 72 per cent of Australian households have home internet access and 78 per cent access to a home computer.<sup>115</sup> The estimated number of business and government internet subscribers is 2.2 million, while the number of household internet subscribers 10.9 million. At the end of June 2011, there were 9.7 million mobile handset internet subscribers in Australia.<sup>116</sup> In this context, it is essential that emergency services agencies actively include social media as one method of communicating with communities.

Social media internet applications such as Twitter, Facebook, YouTube and Flickr are increasingly being recognised as a method of providing, sharing and collaborating information before, during and after emergencies and linking communities geographically or situationally isolated from official emergency information sources. Potentially, information can spread to millions of people very quickly. Social networks may enable people to get the help or information they need.

114 Dufty N, *Using Social Media for Natural Disaster Resilience*, 2011

115 Commonwealth of Australia, *Multipurpose Household Survey (MPHS) for 2008–09*, Australian Bureau of Statistics, [www.abs.gov.au](http://www.abs.gov.au), 2009

116 Commonwealth of Australia, *Internet Activity, Australia, June 2011*, Australian Bureau of Statistics, [www.abs.gov.au](http://www.abs.gov.au), September 2011

More and more organisations are now looking at how technology can bring people together around the world to collaborate and share information and observations in addition to managing the large volume of online data generated during an emergency. An example of this is Crisis Commons ([www.crisiscommons.org](http://www.crisiscommons.org)), a global organisation which brings together disaster management and crisis response teams with volunteer technology communities to create 'crisis camps' in an emergency. Crisis camp groups share, correct and analyse information online, including information from social media, generating accurate maps and other resources that are used by organisations such as the Red Cross, United Nations and United States Federal Emergency Management Agency.

Another example is Random Hacks of Kindness, where technology communities around the world work together to devise the most effective technology solutions to assist in solving set problems. Random Hacks of Kindness developed from a software industry panel discussion in June 2009 from which attendees agreed to use their developer communities to create solutions that will have an impact on disaster response, risk reduction and recovery. The initiative now includes global technology partners Microsoft, Yahoo!, Google, NASA and the World Bank.<sup>117</sup> The most recent Random Hacks of Kindness global event focused on developing technology solutions to aid in disaster management.

An Australian example of community information being shared online is Bushfire Connect ([www.bushfireconnect.org](http://www.bushfireconnect.org)). Bushfire Connect is a community developed website set up to allow community observations of bushfires to be added along with official notifications. The Bushfire Connect website maps fire related incidents added to by people via SMS, email, Twitter, smart phone applications or through the website. People in remote areas needing information quickly can receive customised, automatic SMS alerts direct to their telephones. The website has been developed using the open source platform Ushahidi, which enables the uploading of data directly from smart phones and portable devices to a site dedicated to storing this data. Bushfire Connect utilises a network of volunteers to manage and filter incoming data in a model similar to Crisis Commons.

Social media's ability to connect and share information across individuals and organisations has been demonstrated through recent natural events such as the Queensland floods and Cyclone Yasi, the 2011 Japanese earthquake and tsunami, the 2011 Christchurch earthquake, the 2010 Haitian earthquake and the 2009 Victorian bushfires.

The following is an example of Twitter use during the Victorian bushfires.

*Initially I used Twitter on Black Saturday to get a heads-up on the Churchill fires, as my niece lived in that area of Gippsland. Once the situation there was a little easier, I helped out with the relaying of important information on Twitter.*

*It was a crash course in using Twitter and other social media. Learning quickly how to retweet (relay) news items, situation updates, etc., keeping an eye on the main bushfire hashtags for news or new information and other details.*

*Along the way one could also learn quickly to check the Google Mashup Map to have an idea of going fires and those safe/controlled/contained. There were other resources over the following six weeks as more people put up websites to help as best they could.*<sup>118</sup>

There is significant take up of social media in the community and increasingly in the emergency services agencies, though some agencies are more advanced than others. The interaction between agencies and the community using social media is critical, especially as the community is not only already reacting to the information publicly available through social media but building an expectation that timely and trusted information will be made available through these communication streams.

In response to the VBRC *Interim Report* recommendations, the Victorian emergency services agencies formed a New Media Working Group to provide strategic policy advice to the emergency services sector on the use of social media for emergency information. The working group, currently chaired by the OESC, examines issues including:

- social media and online strategies for the emergency services sector
- embedding social media into agency operational practice and supporting this with policy
- integrating preparedness and recovery information with emergency information and warnings online and through social media

<sup>117</sup> Further details on Random Hacks of Kindness is available from the website at [www.rhok.org](http://www.rhok.org)

<sup>118</sup> Hall G, *Twitter/Social Media During The Victorian Bushfires, February 2009...A Case Study*, NGIS Web 2.0 Report. Government 2.0 Taskforce, Commonwealth of Australia, <http://gov2em.net.au/> December 2009

- mapping, tracking and sharing best practice for current social media initiatives within Victorian emergency services
- training, technological and resourcing requirements for using social media
- providing long term guidance on the delivery of social media across the sector.

Social media can provide emergency managers with opportunities to directly communicate with the community and for the community to engage in emergency management topics. Depending upon the specific social media channel, a direct one-way engagement or a two-way communication flow can be initiated however, social media is built on the premise of two-way communication. Many Victorian agencies such as the CFA, VicPol, MFB and VicRoads have embraced social media as part of their warning and public information strategies. However, a coordinated whole of government approach or policy has not yet been developed.

In addition, many mobile telephones now support social media applications (such as Facebook and Twitter) and as affordability and dependence on mobile technology increases, the need to use mobile devices and social media is likely to grow. For example, the CFA mobile website and CFA FireReady smartphone application allow users to access timely and accurate information to help them understand their bushfire risk on most mobile devices with internet access.

CFA's social media presence includes Facebook (91,900 'likes'), Twitter (around 3,900 followers) for general CFA information (CFA Connect) and more than 2,900 followers of its CFA Updates for official emergency warnings, incident updates and media releases. VicPol uses Facebook (around 7,900 'likes') and Twitter (around 24,900 followers). VicRoads also uses a Twitter account (around 2,490 followers).

To support dissemination of warnings and information through the internet, many agencies use Really Simple Syndication (RSS) to allow users (subscribers) to have website content delivered directly to them on one webpage, via an RSS feed reader. By way of example, CFA provide RSS feeds for services including warnings and advice and incident summaries, while VicPol provides RSS feeds for its latest news, video and audio published on VicPol News.

In comparison, VICSES' Facebook presence ([www.facebook.com/vicses](http://www.facebook.com/vicses)) was launched in February 2010 and now has more than 4,800 'likes'. Its primary use is in supporting community education and emergency information processes. The VFR notes that the current site is not constantly monitored which impacts on the immediacy of information sharing and collaboration. However, during the January and February flood events its use included:

*From about week two of the event(s) each press conference was filmed and uploaded to the Facebook page. Terrific response from the community and very positive comments about being able to view the whole thing, not just a 4-5 second grab on the news.*

*A two-way feedback mechanism with some direct enquiries received from the public.*

*Facebook page linked with many of the 'groups' that were started during the flood, which facilitated information being disseminated to the wider community.<sup>119</sup>*

VICSES launched its presence on YouTube in June 2011 and has since used this form of social media to provide video content in relation to flood and storm events.

During the 2010–11 events, "the need to update the information line and the website before issuing an EA was seen to add an hour or more to the dissemination time by the time it went out, it was no longer accurate or current, particularly in quickly rising events".<sup>120</sup>

The introduction of the internet based One Source One Message (OSOM) system by VICSES in July 2011 has enabled authorised warnings and emergency information to be published direct to websites and emailed simultaneously to multiple sources, including media outlets and the Flood and Storm Information Line. The OSOM system also replaces the need to manually compile flood bulletins, through use of templates which are built into the system.

<sup>119</sup> Victoria State Emergency Service, Communication Strategies during the floods of January and February 2011, presentation, June 2011

<sup>120</sup> Molino Stewart Pty Ltd, *Examination of the Total Flood Warning System in Victoria*, 2011 Victorian Floods Review, September 2011



The efficiencies of this system were demonstrated when VICSES used OSOM to provide flood warning information to Gippsland communities in July 2011.

*The introduction of OSOM into the VICSES warning system has seen a reduction in the times of being able to compile and release public warning by not only the information officers during an operation but also by the regional duty officers. It has also allowed for the standardised messaging during an event instead of different duty officers rewriting and writing in their style and format. While OSOM is only one tool, we are able to now release warnings within 10 to 20 minutes of it being issued by the BoM instead of the one hour plus it used to take our duty officers.*<sup>121</sup>

Integration of EA and OSOM systems is being progressed by the state's fire agencies, the Fire Services Commissioner and VICSES as part of the implementation of VBRC recommendations, which will further enhance the accuracy and timeliness of warning dissemination through "technology platforms that are tenure and agency blind".<sup>122</sup>

With financial support from the private sector, VICSES is enhancing its web presence with a new public website planned for late 2011. The website will be independent of Department of Justice information technology systems. Enhanced speed and reliability, coupled with the OSOM system, will enable VICSES to integrate social media as part of its core communication of warnings through Facebook, Twitter as well as via RSS feed.

The VFR is aware of a study commissioned by the Commonwealth Government to assess and trial the use of social media for improving location enabled information sharing between emergency management agencies and the affected community. The project arose in recognition that in major recent bushfire incidents (Canberra 2003, Victoria 2009), traditional intelligence technologies and methods could not cope with the magnitude of the event. Importantly, the study identified examples where social media enhanced traditional information management practices, helping save property and lives. The study also concluded emergency services organisations need to actively engage with the community using social media or risk being left behind.<sup>123</sup> The conceptual model depicted in figure 11 illustrates the potential for information flow from agency to community, community to community and community back to agencies as potential intelligence.

During the February flood events, VICSES established a strategic intelligence cell trial in the SCC, to assist in gathering information through public sources, primarily social media and mainstream media such as Facebook and Twitter. The cell was successful in identifying local community social media forums (for example, in Rochester and Koo Wee Rup), which local communities had established to share information about flooding.

The trial identified that social media could be used to gain insight from local communities on the impacts of flooding and emergency services could potentially contribute to conversations through social media to gain further insight. The benefits of accessing information from social media has been explored in other emergencies and, while the results from this trial were inconclusive, further research into the value of this source of information to support flood intelligence is recommended.

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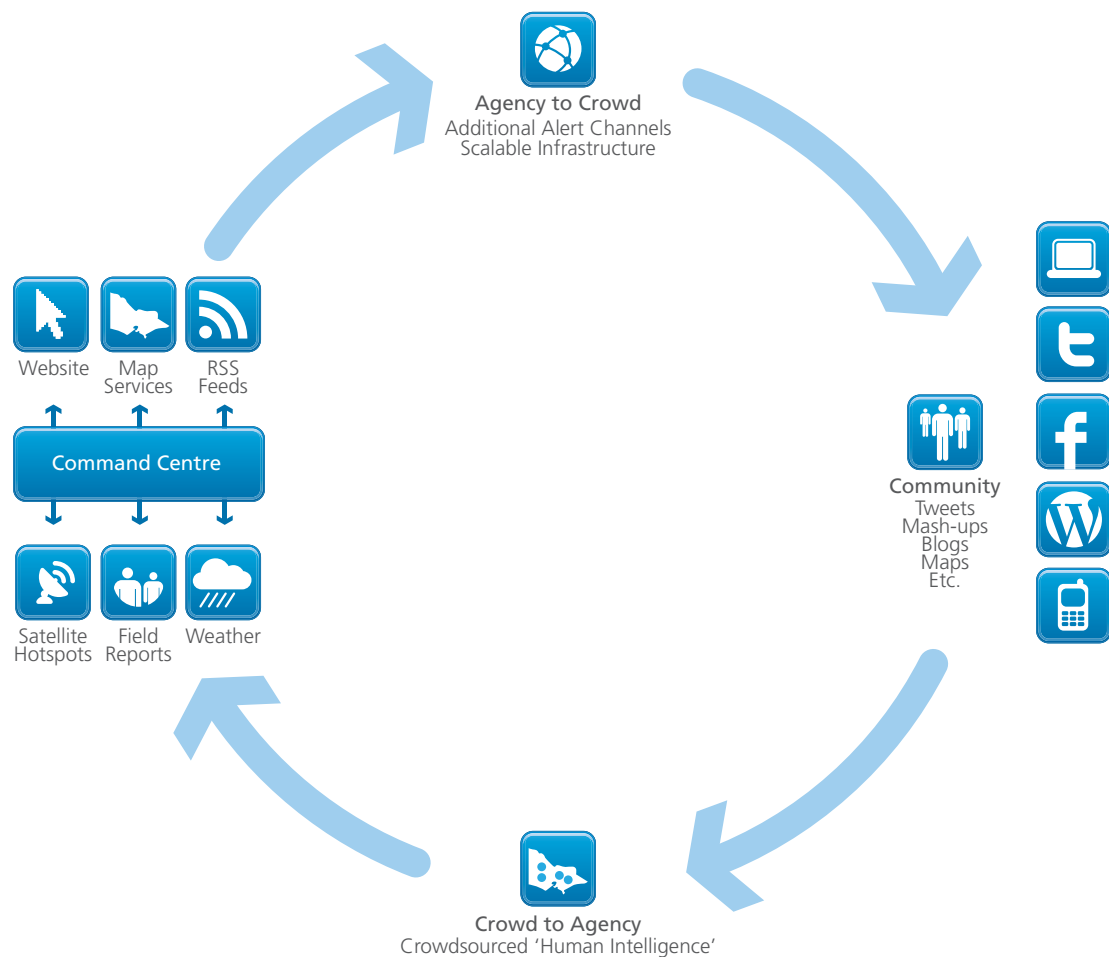
121 VICSES, advice to VFR, 11 October 2011

122 Ferguson E, *Recognising CFA service, OSOM and Trust*, CFA, [www.cfaconnect.net.au](http://www.cfaconnect.net.au), 1 August 2011

123 NGIS Australia, *Social Media helping Emergency Management*, Government 2.0 Taskforce, Commonwealth of Australia, <http://gov2em.net.au/>, December 2009



Figure 11<sup>124</sup> – The potential of social media in emergency management communications



124 ibid

### Queensland Police Service – Use of social media in the Queensland floods<sup>125</sup>

A legislative change on 1 November 2010 resulted in the Queensland Police Service (QPS) becoming the lead agency in the response phase of a disaster. By this date, approximately six months after the social media trial began, the QPS had 8000 'likes' on Facebook and 1000 followers on Twitter.

On Christmas Day 2010 tropical cyclone Tasha brought heavy rain to central Queensland, resulting in significant floods. During this time, police media used its established processes to deliver public safety information about the extreme weather events to the media and public. In addition to issuing regular media releases to the mainstream media and uploading these releases to the QPS website, it was also part of the general process to add these media releases to the QPS Facebook page and link to these on Twitter.

On January 10, 2011 a flash flood struck Toowoomba and the Lockyer Valley. Just days later, significant floods hit Ipswich and Brisbane. By the second week of January, 200,000 Queenslanders were flood affected and three-quarters of the state was disaster declared.

In the 24 hour period following the flash floods, the number of 'likes' on the QPS Facebook page increased from approximately 17,000 to 100,000. This same day the QPS Facebook page generated 39 million post impressions, equating to 450 post views per second over the peak 24 hour period.

This crossover from 'new media' to 'old media' allowed information published by the team to be distributed at a speed and to a sheer number of people not previously possible. People stranded by the side of the road, or in their homes isolated by floodwaters and without electricity, people hunkered down in their bathrooms under mattresses as cyclones passed over their houses, members of the deaf communities, hearing impaired and people interstate or overseas wanting information on their loved ones could access detailed, up-to-the-moment information.

QPS cite benefits of social media to include:

- It is immediate and allowed Police Media to proactively push out large volumes of information to large numbers of people ensuring there was no vacuum of official information.
- The QPS Facebook page became the trusted, authoritative hub for the dissemination of information and facts for the community and media.
- Large amounts of specific information could be directed straight to communities without them having to rely on mainstream media coverage to access relevant details.
- The QPS quickly killed rumour and misreporting before it became 'fact' in the mainstream media, mainly through the #mythbuster hashtag.
- It provides access to immediate feedback and information from the public at scenes.
- It provided situational awareness for QPS members in disaster-affected locations who otherwise had no means of communications.

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<sup>125</sup> Queensland Police Service, Disaster Management and Social Media – a case study, Queensland Police Service, [www.police.qld.gov.au](http://www.police.qld.gov.au), 2011

### Public submission – Dingee

During Friday evening, all day Saturday and Sunday the centre received unrecordable numbers of telephone enquiries regarding the status of the town, roads and access to the area. We put messages up on limited areas of Facebook which was an easy option.

### Public submission – Kerang

On Sunday 16 January at the Kerang swimming pool, I heard a friend remark that her daughter had learnt by Facebook that there would be a meeting at Kerang Memorial Hall on Monday 17 January.

### City of Casey

During the February 2011 emergency, there were issues regarding how quickly council could get accurate and validated information to the community. While council staff were reliant on official information coming to them via the MECC and from the SES as lead agency, it was clear that evacuees at the relief centre were using social media as a way of informing themselves about what was happening.

### Mildura Rural City Council

It's crucial that information is constantly repeated in a variety of ways to ensure people are able to reach their unique stage of being receptive to this information. Our Facebook and Twitter accounts allow us to enhance our communication channels and ensure all demographics are targeted<sup>127</sup>

Research undertaken for OESC and VICSES cites the strength of social media in information sharing during 2011 flood events. The analysis of more than 320,000 social media (such as Twitter and Facebook entries) mentions related to floods identified more than 12,000 of those were relevant to the Victorian floods. Findings from this research showed the key behaviour documented was spreading information through social media channels, with information generally helpful and positive in its nature.<sup>126</sup>

The OESC research also identified that “different channels are used in quite distinct ways for different message types”. Twitter is most often used to spread warnings ('message spreaders') and information, whereas blogs are primarily used for commentary. Facebook, while used for people involved in the floods (refer to *Queensland Police Service – Use of Social Media*), the overall number of comments was much lower. Video was most often posted by people in the floods.<sup>128</sup>

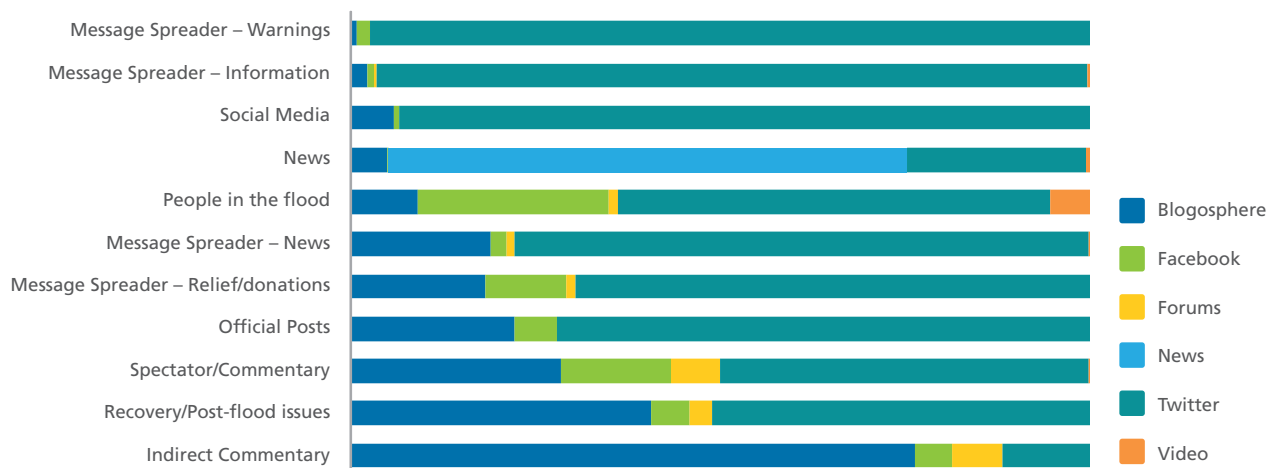
As shown in figure 12 on the page following, a large proportion of the social media commentary is news. News can be the headline for press articles or TV stories or online stories. These comments are aiming to attract readership.

126 Alliance Strategic Research, *Social Media in the Victorian Floods*, State of Victoria, [www.oesc.vic.gov.au](http://www.oesc.vic.gov.au), June 2011

127 Mildura Rural City Council, *Social media helping people through flood recovery*, 5 July 2011

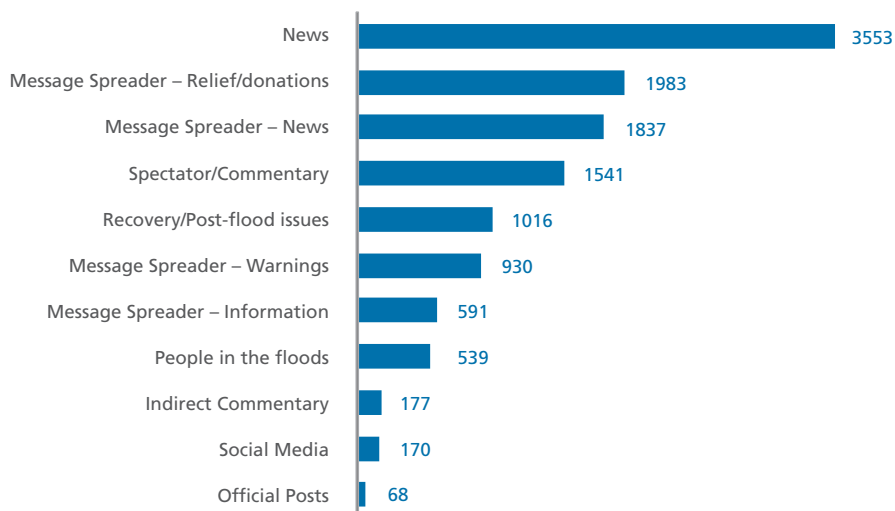
128 Op.cit

Figure 12<sup>129</sup> – Source by intent of comment



'Message spreading' (of one sort or another) is a large part of the social media commentary. Message spreading does not just relate to warnings and public information, but as shown in figure 13, was used more than 1500 times to 'send on' those messages.

Figure 13<sup>130</sup> – Volume and type of comment



129 ibid p 18

130 ibid, p15

Research undertaken by the VFR indicated approximately one in seven or 14 per cent of householders regularly communicated and obtained information about the floods through the social media of Facebook and Twitter, with respondents aged 18 to 34 years (31 per cent) the most prevalent users of social media to communicate and access information.

In one metropolitan Melbourne survey, the VFR research found that about 10 per cent of householders regularly communicated and obtained information about the floods through Facebook and Twitter. While the figure is low, importantly this group was characterised by those in the younger age group residing in urban or urban/rural areas, with access to smartphones and the internet; a demographic whose attention is hard to capture through more traditional communication methods. This finding reiterates existing good communication practice, that no one method of warning and public information should be used in isolation.

The challenge for government and emergency service agencies is to ensure resource capacity to support the adoption of social media as one method of reliable, timely and accurate two-way communication.

#### **Recommendation 41:**

The VFR recommends that:

the state actively pursue the use of social media as part of its emergency warning and public information system.

#### **Recommendation 42:**

The VFR recommends that:

the state undertake further trials to explore the opportunity for greater use of social media as a credible source of information to and from the public during an emergency.

# Chapter Three

Emergency services command and control arrangements utilised to manage the emergency





At the outset of this chapter, the VFR puts on record its acknowledgment of the commitment, dedication and work ethic of the entire Victorian emergency services workforce, without which the state would be poorly placed to contend with emergency events. In the course of reviewing these flood events the VFR has learned of many examples of both volunteer and paid emergency services personnel working tirelessly and in arduous conditions, often alongside community members to contend with the floods. This review of command and control arrangements should not in any way be construed as criticism of these individuals, but is focused on an assessment of the systems, processes and structures that underpin the command and control arrangements.

From Victoria's significant history of catastrophic emergency events a complex suite of emergency management arrangements have been developed and these are detailed in a variety of Parliamentary Acts and associated policy documents. The Ash Wednesday bushfires of 1983 preceded proclamation of the EM Act. More recently, the devastating Black Saturday bushfires of 7 February 2009, led to a revision of the state's emergency command and control arrangements. History now demonstrates that the first real pressure test for these revised command and control arrangements came not in the context of a bushfire response, but in contending with the Victorian floods.

In addition to focusing on emergency services command and control, this chapter will also comment upon a function known as coordination, which has clear linkages to the exercise of command and control. The concepts of command, control and coordination are terms used within the emergency services sector to describe functions performed in the management of emergencies. Each concept will be explained in greater detail within this chapter.

Prior to providing any analysis of the application of the command and control arrangements for the flood events, some commentary is first necessary to outline the statutory and policy frameworks in place within Victoria for managing emergencies that may threaten or occur.

## Legislative provisions

In Victoria, the EM Act provides the legislative foundation for the organisation of emergency management.

The EM Act provides a broad definition of an emergency which, in addition to readily recognised emergencies such as flood and fire, includes incidents such as epidemics, riots and disruptions to essential services that may serve to threaten or endanger the safety or health of persons in Victoria. The EM Act details objectives aimed at ensuring that emergency management is organised within a structure encompassing emergency prevention, response and recovery.<sup>131</sup>

Various other agency specific Acts exist which articulate specific objectives, functions, powers and personal indemnifications. Examples include the Country Fire Authority Act, the Metropolitan Fire Brigade Act, and the *Victoria State Emergency Service Act 2005*.

## Policy

The EM Act is 'operationalised' by the EMMV. While the EMMV has no legislative basis, it serves as a reference guide for emergency management practitioners and consolidates emergency management principles, policies, plans and guidelines into the one document (albeit in different parts of the EMMV). The arrangements detailed are intended to deal with the management of all types of emergencies by bringing together, in an integrated organisational network, the resources of the many agencies and individuals needed to take action to prevent or mitigate, respond to and recover from emergencies.<sup>132</sup> What has become common language in the emergency management sector, without being formalised in either the EM Act or the EMMV, are the terms 'all hazards' and 'all agencies'.

An '**all hazards**' approach describes the process of dealing with all types of emergencies or disasters and civil defence using the same set of management arrangements.<sup>133</sup>

An '**all agencies**' approach describes the arrangements for dealing with emergencies and disasters involving an active partnership between commonwealth, state, territory and local levels of government, statutory authorities, and voluntary and community organisations.<sup>134</sup>

131 *Emergency Management Act 1986*, s 4A

132 State of Victoria, *Emergency Management Manual* Victoria, 2011, p 1-5

133 Emergency Management Australia, *Australian Emergency Management Glossary*, Manual 03, Australian Government, Attorney General's Department, page 5

134 *ibid*

The EMMV is divided into 11 parts as follows:

- Part 1 Introduction to Emergency Management Arrangements
- Part 2 Emergency Risk Management and Mitigation in Victoria
- Part 3 State Emergency Response Plan (SERP)
- Part 4 State Emergency Recovery Arrangements
- Part 5 State and Regional Emergency Management Planning
- Part 6 Guidelines for Municipal Emergency Management Planning
- Part 7 Emergency Management Agency Roles
- Part 8 Appendices and Glossary
- Part 9 Emergency Management Act
- Part 10 Emergency Management Contact Details<sup>135</sup>
- Part 11 Index.

## Development of the SERP (EMMV Part 3)

The Minister for Police and Emergency Services is the Minister responsible for the EM Act.<sup>136</sup> Prior to legislative amendment to the EM Act on 25 October 2011, section 5 of the EM Act nominated the Minister as the Coordinator in Chief of Emergency Management, with section 5 (2) appointing the Chief Commissioner of Police as the Deputy Coordinator in Chief of Emergency Management. Prior to the recent EM Act amendments, one of the functions of the Minister, as Coordinator in Chief, was to provide for the preparation and periodic review of the State Emergency Response Plan<sup>137</sup> (SERP), which is presented as Part 3 of the EMMV. This task was delegated to the Deputy Coordinator in Chief under the provisions of section 7 of the EM Act.

### Recent developments

A Bill proposing amendment to a number of emergency services legislation provisions was passed by Parliament on 25 October 2011. The *Emergency Management Legislation Amendment Bill 2011* revised the EM Act to:

- Remove the title of Coordinator in Chief of Emergency Management from the Minister for Police and Emergency Services and clarify the role of the Minister to ensure satisfactory emergency management arrangements are in place and remove the Minister's responsibility for any operational matters.

- Broaden the functions of the Chief Commissioner in his or her role as State Emergency Response Coordinator and to ensure the Minister is kept informed during any emergency.
- Clarify that the Minister may delegate to the Chief Commissioner of Police, in his or her role as State Emergency Response Co-ordinator, or any other person, powers or functions under the EM Act or emergency management regulations.

## Command and control arrangements

The SERP details the organisational arrangements, including the command and control arrangements, for managing the response to emergencies in Victoria. The SERP is a dynamic document and is subject to frequent updates. As highlighted earlier, following the Black Saturday bushfires, the SERP was revised to reflect new command and control arrangements to apply from that point onwards.

In brief, these revisions provided what were termed to be more scalable command and control arrangements for the management of incidents ranging from localised emergencies, through to an emergency or group of emergencies of statewide significance. They also provided for recognition of three levels of emergency incidents and also for three tiers of management (municipal tier, regional or area of operations tier, and state tier). There was also a focus on a requirement for agencies to adopt a functions based incident management system, with a scalable chain of command management structure with key decision making points within the structure. Although the Black Saturday bushfires stimulated these revisions, they were to apply to the management of all types of emergency events.

In addition to the EMMV, those involved in emergency management are guided by a variety of advisory practice notes, guidelines and protocols published by OESC. Individual agencies also prepare SOPs to provide operational direction to their personnel.

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<sup>135</sup> This part is not publicly available

<sup>136</sup> General Order issued by Department of Premier and Cabinet allocating responsibility for the administration of Acts of Parliament to Ministers ([www.dpc.vic.gov.au](http://www.dpc.vic.gov.au))

<sup>137</sup> While the *Emergency Management Act 1986* refers the State Emergency Response Plan as 'DISPLAN' (the short title for the State Disaster Plan), the term 'State Emergency Response Plan' is now used in preference to the term 'DISPLAN'

## Incident management systems

The SERP requires agencies undertaking emergency management responsibilities to have in place an Incident Management System (IMS). An IMS is described as not being a fixed set of rules, but rather a flexible and dynamic methodology that can cater for change in the severity of any emergency.<sup>138</sup> An IMS identifies various functions likely to be required to manage an emergency and provides for personnel to be assigned to manage such functions. Incident management functions might include, but are not limited to:

- control
- planning
- operations
- logistics
- intelligence
- public information
- investigation
- finance
- administration
- safety officer/adviser.

The SERP also requires agencies to be capable of pooling their resources to work within a single incident management system.<sup>139</sup> All IMSs must be based on three key principles:

- management by objectives (described as a process of consultative management where the IMT determine the desired outcomes of the incident. These outcomes or objectives are then communicated to the commander and crews involved in the operation)<sup>140</sup>
- functional management (described as the process of using specific functions, such as control, planning, operations and logistics, to manage an incident)<sup>141</sup>
- effective span of control (described as a concept that relates to the number of groups or individuals which one person can successfully supervise. Up to five reporting groups or individuals are considered manageable as this maintains a supervisor's ability to effectively task, monitor and evaluate performance).<sup>142</sup>

The Australasian Fire and Emergency Service Authorities Council (AFAC) has developed an IMS which has been broadly adopted by emergency management agencies within Victoria. This IMS is called the Australasian Inter-service Incident Management System (AIIMS). The AIIMS IMS recognises that when a multi-agency response is required then the operational protocols and procedures of the different agencies will need to be integrated into a unified management system to enable the smooth and effective resolution of the incident.

AFAC describes AIIMS as a high level conceptual management system for any emergency. AIIMS does not detail how any particular incident should be managed, but explains the different roles and functions and principal responsibilities of incident management in a non hazard specific way. It is recognised that managing incidents such as bushfires, floods and outbreak of disease will each require different approaches. Agencies using AIIMS are expected to adapt their internal structures and processes, within the AIIMS framework, to provide the best possible way, as they see it, to combat the incident.

### Incident level categorisation

Within both the SERP and the AIIMS handbook, emergency incidents are classified as either level 1, level 2, or level 3.<sup>143</sup> The level of classification depends on the size of the incident, the extent of resources required to adequately respond to the incident or the risk associated with responding to the incident.

- a level 1 incident is characterised by its capacity to be resolved at the local level with the application of local or initial response resources only
- a level 2 incident is more complex and the response may require deployment of agency resources beyond the initial response
- a level 3 incident is more complex again and may require a more substantial emergency response.

138 State of Victoria, Emergency Management Manual Victoria, 2011, p 3-14

139 *ibid*

140 Australasian Fire and Emergency Service Authorities Council, *The Australasian Inter-Service Management System*, third edition, Glossary, p 92

141 *ibid* p 4

142 Emergency Management Australia, *Australian Emergency Management Glossary*, Manual 03, Australian Government, Attorney General's Department, p 37

143 State of Victoria, Emergency Management Manual Victoria, 2011, p 3-15

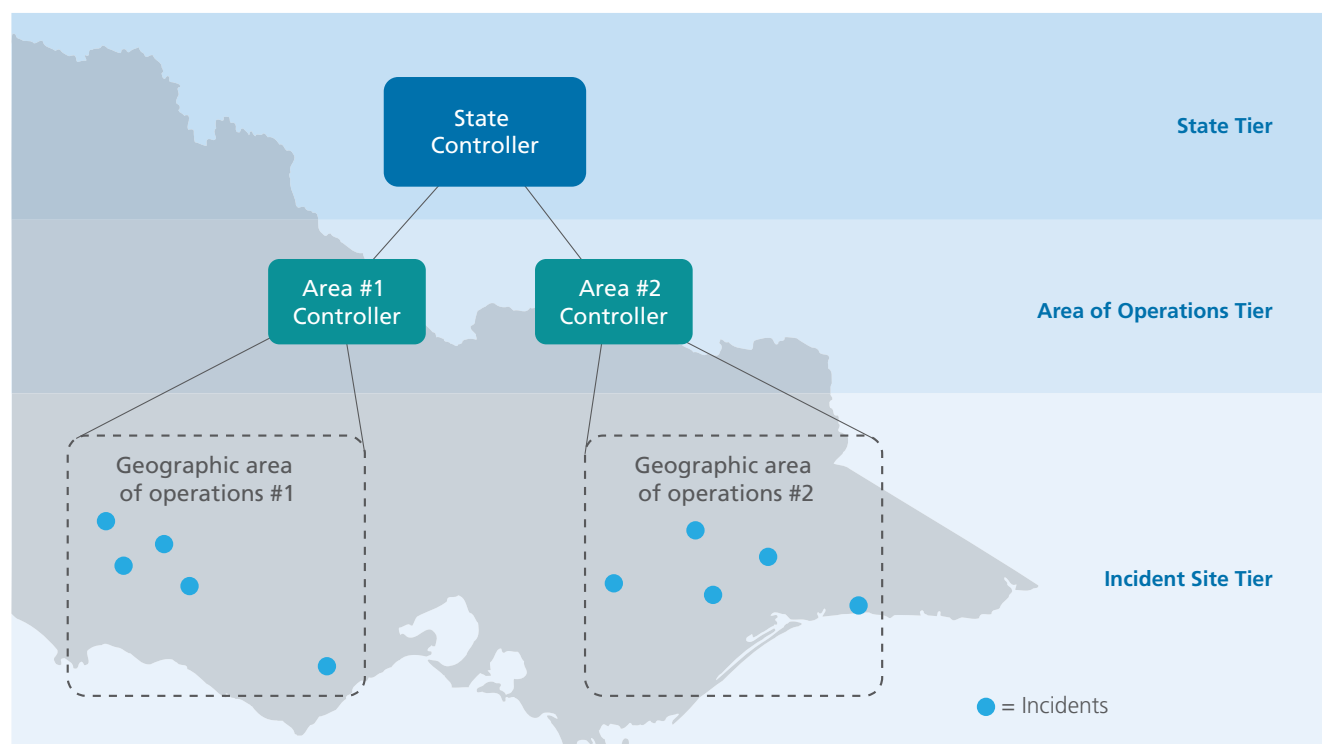
## Tiers of management

In addition to the three levels of incidents previously described, there are three recognised tiers across which emergency management arrangements may be activated.<sup>144</sup> These are:

- incident tier (the location of the emergency event)
- area of operations or regional tier<sup>145</sup> (a geographic area defined to contain an incident or a group of incidents. Such an area may not be constrained by regional or other boundaries and may be determined by the footprint of the particular incident/s)
- state tier.

The arrangements provide for a single controller to be in place at the state tier, with a controller in place at each of the other activated tiers of emergency response. The scale of an emergency incident and span of control parameters will determine which management tiers become operational and in which configuration. Various configurations are possible.<sup>146</sup> For example, an incident tier controller may operate in isolation of any other tiers, or may report directly to the state controller if there is no requirement for an area of operations controller. An area of operations controller may be in place to manage and oversee multiple incidents without any need for a state level controller to be activated. Figure 14 depicts emergency control arrangements at a time when all three tiers have been activated.<sup>147</sup>

Figure 14 – Control tiers



<sup>144</sup> *ibid* p 3-7

<sup>145</sup> A Region is one of the Victorian Government Regions. see also EMMV, p 3-7

<sup>146</sup> *Op.cit* p 3-8

<sup>147</sup> 2009 Victorian Bushfires Royal Commission, Statement of Chief Commissioner S Overland, 2 October 2009, attachment ref. WIT.3010.009.0229, Command and Control for Victoria Emergencies, p 13

Incident level controllers provide input to the process of determining the need for establishment of the next tier control points consistent with advisory triggers detailed in the EMMV.<sup>148</sup> Examples of escalation triggers would include forecasts for extreme weather, depletion of agency resources or anticipated significant impacts to life, property or the environment.

### Incident tier

Level 1, level 2 and level 3 incidents may all occur at the incident tier of emergency management. Control of the incident may be limited to the immediate area and the incident controller will take charge and provide leadership to all responding agencies directed towards the efficient resolution of the incident at that location. In doing so, the incident controller may establish an IMT and an EMT as necessary.

### Incident management team

An IMT consists of the incident controller and the managers of the activated functions of the IMS (for example, those managing functions such as planning, operations and logistics). The IMT's role is to support the incident controller in discharging his or her emergency response accountabilities.

### Emergency management team

An EMT has a different membership and a more strategic focus than an IMT. The EMT will consider issues such as the impact, broader consequences and control priorities for the emergency. Given the breadth of this focus, EMT membership is not fixed and will vary depending on the nature of the emergency, its relative size and complexity. EMT membership may include key personnel from sectors such as health, transport, telecommunications, critical infrastructure or hazard-specific experts. In the case of floods this may, for example, include personnel from CMAs or hydrologists. Further information about EMTs can be found in the EMMV Part 3<sup>149</sup> and in an OESC EMT practice note.<sup>150</sup>

### Establishing facilities for managing emergencies

The AIIIMS manual details requirements for an incident controller to establish an ICC which has appropriate facilities to enable management of the emergency.<sup>151</sup> The AIIIMS manual also details requirements for alerting all participating and relevant personnel and authorities that such a centre has been established. This is because the point where control is being exercised must be readily identifiable to all involved.

### Focus of incident controllers

In accordance with the scalability of the command and control arrangements, controllers at higher tiers of management have a greater focus on strategic and proactive matters while those at the incident level will be more tactically focused.

The controller at the scene of the emergency maintains a more tactical and reactive focus to deal with developments in the emergency event as effectively as possible. The focus of a regional or area of operations controller will shift more towards strategic and proactive management across a number of separate incidents in the defined area. It does not extend to micro-managing each incident controller, but requires operational leadership and management across the defined region/area of operation.

The role of the state controller is to provide strategic leadership for the resolution of the emergencies across Victoria.

This shift in focus of controllers at different tiers is depicted in figure 15.<sup>152</sup>

Figure 15 – Controller's focus



148 State of Victoria, Emergency Management Manual Victoria, 2011, pp 3-8, 9

149 State of Victoria, Emergency Management Manual Victoria, 2011, p 3-18

150 Office of the Emergency Services Commissioner Practice Note: *Emergency Management Team*, May 2009

151 Australasian Fire and Emergency Service Authorities Council, *The Australasian Inter-Service Management System*, third edition, p 28

152 State of Victoria, Emergency Management Manual Victoria, 2011, p 3-14

## Designated control and support agencies

The SERP makes reference to agencies as either 'control' or 'support' agencies. Further detail is provided in Part 7 of the EMMV, where control and key support agencies are nominated for different types of emergencies. A key support agency is one that has specific skills and/or resources to support the response for a particular type of emergency whereas a support agency is one which provides essential services, personnel or material support to assist a control agency or affected persons. Part 7 also provides a list of generic support services and indicates within that list the primary or managing support agency, together with secondary support agencies. These secondary support agencies assist with ancillary services such as first aid and animal welfare.

In the event of a flood, the nominated control agency is VICSES. Key support agencies are nominated as DSE, CMAs, water authorities, municipal councils, CFA, MFB, BOM and Parks Victoria.<sup>153</sup>

Figure 16 serves to illustrate the complexity of Victorian arrangements in terms of the number of designated control agencies for types of incidents that may occur.<sup>154</sup> It should be noted that not all incident types are identified. For example, during these flood events there were many episodes of land slippage. Some of these were quite extensive. At Halls Gap large sections of roads were totally destroyed, water supply infrastructure was significantly damaged and homes were endangered. The Halls Gap landslips led to extended closure of the Grampians National Park which had a profound impact on local tourism. Landslips are not identified as 'incidents' in the current arrangements and accordingly no control agency is nominated. In such instances, VicPol becomes the default control agency. Figure 16 would be further complicated if it were to also include both the key support and support agency roles for the various types of incidents/hazards recognised.

Consideration of figure 16 suggests that in the event of a dam breach the control agency would be DSE. However, the control agency for the resultant flooding would be VICSES. VicPol would be the control agency for any water rescues required and for ensuring public order is maintained. DPI would be the control agency for any essential service (such as gas or electricity) disruptions and also for stock stranded as a consequence of the flooding. Should roads, bridges or tunnels also be affected then the control agency for such developments is VicRoads. If health concerns arise then the relevant control agency to address these is DHS.

These particular hazard specific agency arrangements do not provide for ultimate accountability to sit with one exclusive entity in the event of a multi faceted emergency; instead components within an emergency event sit with different agencies. A simple question of 'who is in charge?' cannot readily be answered without further probing to determine what aspect of the emergency the query related to. An absence of ultimate accountability also means that no clear arbiter exists should prioritisation of response activities be in dispute.

The VFR notes that from a fire management perspective a Fire Services Commissioner has been appointed and this provides a single official with clear lines of authority for major fires occurring in Victoria. The VFR considers that such arrangements should be replicated for major emergencies other than fire so that multiple avenues of authority are not encountered and that clear and unambiguous accountability sits with a readily identifiable official irrespective of the nature of the emergency event.

### Recommendation 43:

The VFR recommends that:

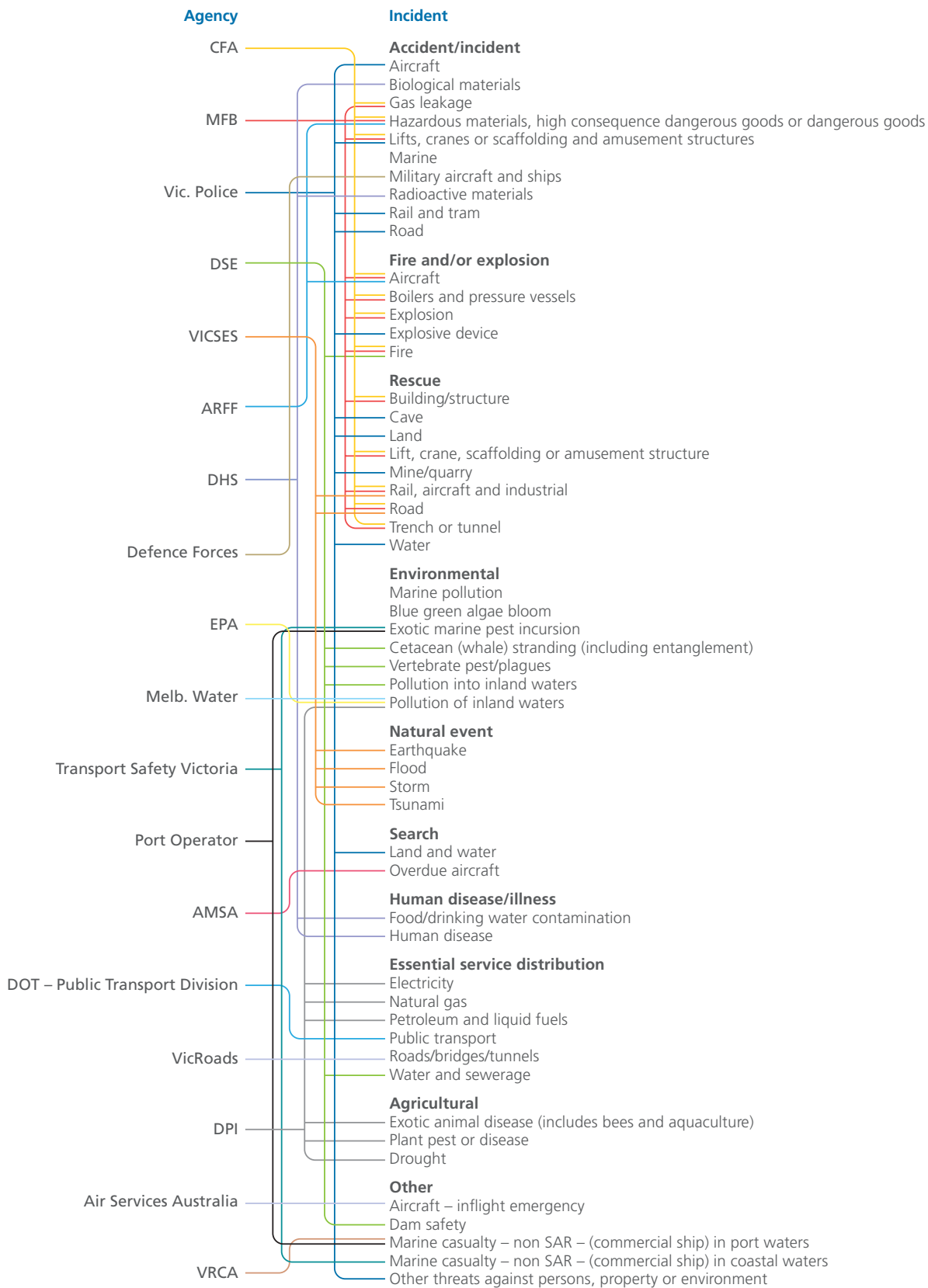
the state appoint a state emergency controller who is ultimately accountable for all major emergencies.

<sup>153</sup> State of Victoria, Emergency Management Manual Victoria, 2011, p 7-3

<sup>154</sup> Office of the Emergency Services Commissioner, Emergency Service Strategy Project – Emergency Services in Victoria – an overview of current arrangements, May 2008, page 7



Figure 16<sup>155</sup> – Control agencies for incident types



155 Sourced from: Office of the Emergency Services Commissioner, Emergency Service Strategy Project – Emergency Services in Victoria – an overview of current arrangements, May 2008, page 7

## Command control and coordination

Command, control and coordination are three separate and distinct terms used to describe the means by which emergency management activities are provided. The terms are explained as follows:

**Command** is the direction of the personnel and resources within an organisation in the performance of the organisation's role and tasks. Authority is established in legislation or by agreement within an agency. Command relates to particular agencies and operates vertically within the agency.<sup>156</sup> For example, by virtue of their rank a senior police officer would have the authority to command subordinate ranking police officers. The police officer's authority to command would apply to commanding other police personnel only and does not extend to commanding personnel from other agencies.

**Control** involves the overall direction of response activities in an emergency. Authority for control is established in legislation or in an emergency response plan. It carries with it the responsibility for tasking other agencies in accordance with the needs of the situation. Control relates to situations and operates horizontally

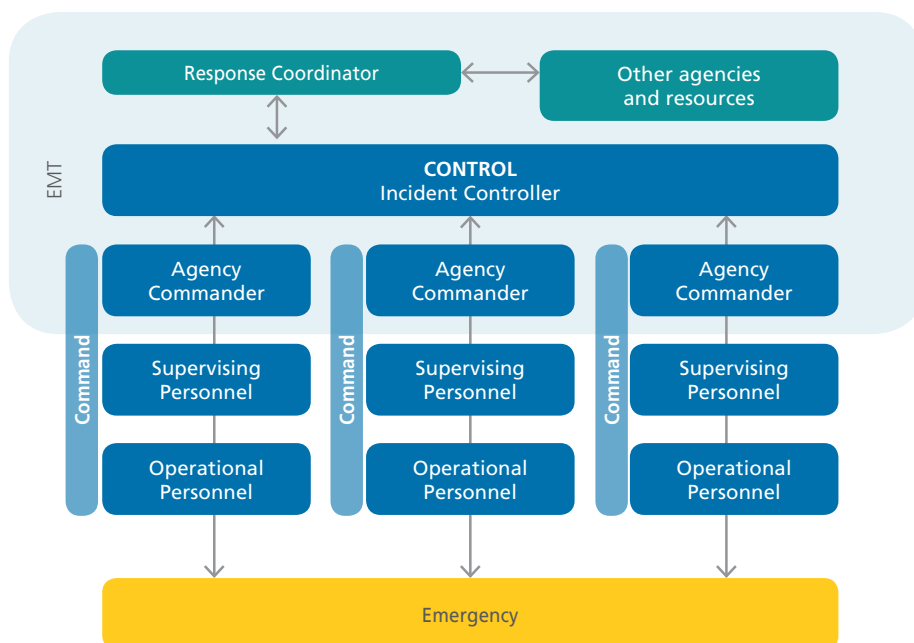
across agencies.<sup>157</sup> For example, in the context of a fire, an officer from the fire agencies would be the incident controller and authorised to exercise control across all of the agencies who may be assisting with the emergency response.

## The coordination function

The coordination role is always a VicPol responsibility and it entails a number of significant functions. Most importantly, it involves oversight of the emergency response to ensure all necessary agencies are in attendance and undertaking appropriate actions to bring the emergency event under effective control. Coordinators are also to ensure that the control agency is issuing timely information and warnings about the emergency. Coordinators also have responsibilities related to resources requested by the agencies contending with the emergency and have statutory powers that may be used to direct agencies relating to resource allocation for emergency response purposes.

Figure 17 illustrates the distinctions between the command, control and coordination functions.

Figure 17<sup>158</sup> – Command/Control/Coordination



156 State of Victoria, Emergency Management Manual Victoria, 2011, p 3-4

157 Ibid p 3-5

158 Ibid p 3-3

## State level arrangements

At state level, Victoria has a complex configuration of working groups and committees intended to assure the readiness and appropriateness of the state's emergency management arrangements, including the command and control arrangements. Section 8 of the EM Act requires the establishment of a VEMC. This is described as the peak emergency advisory body to support the Minister and to advise on all matters, including the coordination of activities of government and non-government agencies relating to the prevention of, response to and recovery from emergencies.<sup>159</sup> Other than detailing this responsibility to advise the Minister, the EM Act does not contain any provisions regarding the role, function, or what is required of VEMC. Excluding what is detailed in the EM Act there is no formally documented policy intent or purpose for VEMC.

Also in place to assist the Minister during significant emergencies is a VEMC Coordination Group (VEMC-CG). The role of VEMC-CG is briefly outlined in the EMMV where it states that VEMC-CG actively supports response and recovery activities and in providing an information flow during significant emergencies.<sup>160</sup>

While the VEMC is the only forum required by legislation, section 9 of the EM Act enables establishment of other committees as may be necessary to ensure comprehensive and integrated emergency management. The VFR is aware that more than 40 committees/sub committees and working groups (from here on in referred to as the 'committees') have been established. The terms of reference and membership for many (but not all) of these committees are detailed in Part 5 of the EMMV (state and regional emergency management planning). To the knowledge of the VFR there is no organisational chart in existence which maps in entirety this complex committee structure and the various roles, relationships and reporting lines involved. The lack of such information is unhelpful and does little to assure either accountability or that a coordinated, whole of government, end to end focus is being applied to emergency management. (A list of all committees the VFR has been able to identify is at Appendix 5)

VEMC, as the peak emergency advisory body, meets once, or at most twice a year. Its membership varies, but may include about 20 nominated agencies/departments, and the various chairs of committees it oversees.

### VEMC assessment – recent reviews

In 2009 VEMC was the subject of a consultant's review which the VFR understands was never finalised. The review's draft report, dated June 2009, stated:<sup>161</sup>

*The council has become mechanistic, lacking in strategic direction and capability and ultimately lacking in any real purpose, apart from statutory compliance in briefing the Minister. There are a number of reasons for this:*

- *the frequency of meetings; roundtable discussions that occur once or twice each year cannot be expected to be anything more than discussions*
- *the briefings and discussions themselves are generally anodyne because of an avoidance of difficult issues in an uncontrolled format in front of the Minister.*

*Even with more frequent meetings, the lack of a working structure has tended to preclude more than formal functions and as a council it is too ungainly to deliver concrete outcomes without a working structure of sub-committees.*

*In the absence of a unifying strategic vision or framework, the formalistic nature of proceedings as they currently exist has become self perpetuating.*

<sup>159</sup> Emergency Management Act 1986 s. 8 (1)

<sup>160</sup> State of Victoria, Emergency Management Manual Victoria, 2011, p 1-8

<sup>161</sup> Office of the Emergency Services Commissioner, *Interim Review of the Victorian Emergency Management Council, Draft Interim Report*, Department of Justice, June 2009

The draft review report further summarised:

*By way of conclusion, far from enjoying a wide range of activity and vision, as is allowed for in the language of section 8 of the Act, the council (VEMC) appears to have been reduced to a formalistic, set piece meeting, which serves no purpose other than statutory compliance.*

A scan of recent VEMC minutes lends weight to this review assessment. VEMC seems to be a forum that has served merely to provide activity updates to the Minister, rather than a place where critical emergency management related issues can be debated to determine high level, whole of sector, strategic direction. The VFR has sighted little evidence of VEMC either directing action or holding subordinate committees to account for necessary or due action.

The VBRC also heard evidence from the state indicating that VEMC was not optimally effective, responsible or accountable.<sup>162</sup> This evidence concluded that VEMC needed to be reconfigured as it had become too large and unwieldy to perform its role effectively.

Given this background material, and as a consequence of themes emerging from the debriefing processes, the VFR conducted further research into the state level arrangements. Stakeholder agencies and departments were asked their views concerning the functionality and effectiveness of the arrangements. Also sought were recent examples of works produced by the various committees within the arrangements, including meeting agendas and minutes, work programs and reports to higher level committees, or to VEMC itself.

This research has revealed broad agreement across participating agencies that VEMC and the subordinate committee and working group structure is in dire need of reconfiguration in order to function effectively. Comments provided to the VFR suggest the present arrangements are unstructured, with tenuous and obscure linkages and poor governance, accountability and outcome productivity.

Many agencies consider that there is a degree of overlap in a number of the committees and that this is consequential of the lack of definition and clarity of the hierarchy of the structure. Despite requirements for periodic reporting by some committees, a lack of compliance is evident, as is a lack of governance mechanisms to validate that information provided is factual. The VFR has learned of examples which attest to this. The VFR reviewed assurances provided to VEMC-CG in September 2010 that all municipalities in north eastern Victoria had municipal flood sub-plans in place for addressing anticipated flooding events. VFR inquiries disclosed that despite these assurances, this was not the case.

Agency submissions suggested that in some instances state level committees were established to address specific issues yet continued to exist after such issues had been addressed. The VFR is aware of some committees that have been inactive for several years. In one particular instance, a committee with annual reporting obligations is said to have effectively ceased functioning five years ago. Agencies also reported difficulties in affording an appropriate level of representation to the many (and sometimes overlapping) committee meetings due to the sheer number of these. It is suggested that this leads to routine attendance delegation to persons not familiar with a committee's functions and not empowered to advocate agency positions. This is said to further devalue productivity and committee functionality.

The VFR does not consider that the Minister's statutory obligation to ensure that comprehensive and integrated emergency management arrangements are provided in Victoria could be fulfilled given these current state level arrangements.

### Broader government committees

There are two further whole of government committees that may be activated when emergencies threaten or impact. Neither of these is articulated in any legislation, however they are each briefly described in the EMMV.<sup>163</sup>

- Security and Emergencies Committee (SEC) – chaired by the Premier
- Central Government Response Committee (CGRC) – chaired by the Secretary of DPC.

<sup>162</sup> 2009 Victorian Bushfires Royal Commission, statement of P Armytage, Secretary, Department of Justice, 28 April 2010, paragraph 166

<sup>163</sup> State of Victoria, Emergency Management Manual Victoria, 2011, p 1-9

These committees provide strategic direction when emergencies have impacts beyond one portfolio or department. (Cabinet Ministers, through the SEC and senior departmental officials, through CGRC). These committees meet regularly to consider emergency management policy issues and in response to major emergencies. Following the January 2011 floods, government established a Flood Recovery Cabinet Taskforce, comprised of Ministers and a Secretaries' Flood Recovery Group, comprised of senior officials from all departments, to focus on the complex social, economic and reconstruction challenges presented by the floods. SEC has since resumed cabinet-level oversight of flood recovery and reconstruction.

The previously mentioned 2009 consultant's review of VEMC also provided some comment upon CGRC operations. It noted there was potential for CGRC to decide on action that is not coordinated with, or is inconsistent with, actions arising from emergency management control and coordination decisions. The consultant's review noted that while this had not been a serious problem to date, it did point to a need for greater role clarity to avoid any such conflict.

Some agencies have questioned the purpose of CGRC and suggest it creates the potential for overlap of function, given the focus and activities of the State Emergency Management Team (SEMT) that was operating to contend with the floods. An example detailed to the VFR to illustrate this issue concerned flooding in the Mildura area and the detection of an outbreak of Murray Valley encephalitis. This developing issue during the recovery phase required a new response and was raised with CGRC, who could have dealt with it given its cross-departmental coordination and operational support role. However, CGRC tasked the SEMT to manage and work with local authorities to reduce the risk of the virus spreading and to address the issue of stagnant water surrounding townships.

The government's Green Paper on crisis and emergency management *Towards a More Disaster Resilient and Safer Victoria* also highlights the need for clarity in defining the respective roles of strategic whole-of-government bodies such as SEC and CGRC versus operational command, control and coordination bodies.

Other agencies have suggested to the VFR that uncertainty exists concerning activation triggers, roles, reporting lines and accountabilities for CGRC and that clarification of such matters is required to ensure common understanding and avoid counteracting or duplicating efforts. Concerns have also been raised by some agencies about the requirements to provide senior agency representation at a variety of potentially overlapping state level forums at different locations when emergency events occur, suggesting that this leads to senior management fatigue and provides an unproductive distraction from critical core agency business.

#### Recommendation 44:

The VFR recommends that:

the state reconfigure the Victorian Emergency Management Council and the supportive committee arrangements to ensure a comprehensive, accountable, effective and integrated approach to the development of emergency management arrangements is in place for Victoria. The process should also include consideration of the Security and Emergencies Committee and Central Government Response Committee roles, functions, reporting arrangements and relationships with other state level emergency management groups. Settled arrangements must be clearly articulated to ensure stakeholder understanding.

### Statewide command and control capacity

In the VFR's *Interim Report* of 30 June 2011, significant concerns were detailed in relation to the extent to which the state could sustain incident management capacity and capability, either in terms of significant rapid onset or sustained large scale emergency events. While the state's command and control arrangements appear to be sufficient for the management of small, everyday types of emergency events, scale-up capability for large or protracted events is lacking. Over the course of its multi-agency debriefing exercises, the VFR commonly heard of difficulties in establishing and then sustaining effective incident control structures in the early stages of emergency response (days one to three). This remained the case even when incident control structures were multi-agency in configuration. Multi-agency operations were hampered due to interoperability issues being a consequence of each agency having separate IT and communications systems that were not integrated. Agencies also utilised different processes for managing the emergency which again complicated joined up operations (these matters will be elaborated on in sections to follow).

The VFR queried experienced emergency management practitioners across a variety of agencies concerning staff numbers required for a level 3 ICC under the revised arrangements. A consensus of views suggested a staffing complement of between 30 and 35 suitably experienced people was necessary in order to fulfil all necessary functional roles and have a level 3 ICC operate effectively. In many cases this could not readily be achieved.

The VFR often heard accounts of those required to fulfil ICC roles not being trained for their roles, or being required to fulfil several roles simultaneously due to unavailability of sufficient and trained personnel. Those trained and familiar with the roles required of them often worked for excessive hours as no relief arrangements could be identified. Requirements for ICCs at multiple locations limited opportunity to draw resources away from other areas who were fully engaged managing their own events. The interoperability issues mentioned complicated usage of other agency personnel.

The VFR also heard of examples where control centres were established at lower levels than what it was perceived the nature of the incident called for, simply because insufficient personnel were available to provide for a level 3 control centre establishment. At numerous locations the VFR heard that when ICC structures could not be fully established or sustained, the first casualty would be strategy, with such centres then becoming reactive and losing focus on incident management.

Capacity issues also meant that in some locations, the span of control for ICCs was stretched too far. A post flood internal review commissioned by VICSES highlights the case of Loddon Mallee, which had eight of its 10 municipalities either flooded, flood threatened, or recovering from flood across the duration of these events. The VICSES North West Region Flood Response Plan advised that an area of operation is to be established when a level 3 ICC is operating with three or more MECCs. It would appear that VICSES were struggling to sustain operations at one regional control centre and capacity simply did not exist to establish other levels of control, even though this seemed warranted.

In its own internal post flood event review VICSES acknowledged its capacity limitations:

*In reality, VICSES is not resourced for the number of trained personnel needed to provide command and control for a major and sustained event as required by the EMMV or its own policy. The situation leaves VICSES and the state at risk and exposed to criticism or possible litigation should an adverse finding be made that VICSES did not employ its own policy guidelines.*<sup>164</sup>

On 1 September 2010, in a briefing to VEMC-CG concerning statewide flood preparedness, VICSES highlighted potential capacity issues that may arise. This written briefing advised:<sup>165</sup>

*VICSES has developed deployment plans that will move key command and control staff from across the state to support these ICCs and the SCC. While VICSES is confident of being able to field the key roles at the two ICCS identified for the north east it will leave VICSES vulnerable in other parts of the state due to the small number of staff VICSES has to undertake command and control functions.*

Effective emergency management is dependent upon suitably resourced and organised control structures to provide leadership, management and direction. Nowhere is this more important than at the incident level where controllers are responsible for contending with dynamic, complex and often confusing events. In the absence of effective control capacity there is little likelihood that emergency response activities will be provided in an organised, accountable and most efficient manner to address community needs. The VFR considers that at present the state does not have sufficient incident management capability and capacity to contend with large scale or protracted emergency events.

Given the seriousness of these concerns, rather than wait for its scheduled formal reporting to government, the VFR reported such matters immediately. On 5 April 2011, the chair of the VFR attended the forum considered most appropriate to hear of these concerns; the SC&MC Bushfires Sub-Committee. The VFR Chair recommended that, as a matter of urgency, this sub-committee initiate appropriate action to ensure that an all hazard incident management capacity and capability is available statewide. The VFR Chair also recommended that this action should include a primary focus on the most effective means of managing the event, rather than on the agency with current statutory responsibility for control of the hazard in question.

As highlighted in the VFR *Interim Report*, the VFR was advised that the SC&MC Bushfires Sub-Committee accepted this recommendation and would be undertaking work with the necessary agencies to address such matters.<sup>166</sup>

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164 2011 VICSES After Action Review – Summary of findings, May 2011, paragraph 3.13

165 VICSES briefing to Victorian Emergency Management Council – Coordination Group, 1 September 2010

166 Neil Comrie AO APM, Review of the 2010–11 Flood Warnings and Response: Interim Report, 30 June 2011, p 17



Subsequent to releasing its *Interim Report*, the VFR received a variety of submissions commenting on control capability and capacity for the management of large scale and protracted emergency events. Common across these was broad recognition of the need for a whole of sector and 'all hazards' focus to be applied to formulating solutions. By way of example, the following extract from a VICSES submission to the VFR stated:

*VICSES believes that all agencies will find it challenging to appoint adequate numbers of appropriately trained personnel to the role of incident controller and other key positions during future protracted events irrespective of the event or hazard to be responded to. VICSES supports the development of a more flexible statewide 'all hazards' approach to the training and appointment of functional cell leaders during protracted emergencies. To achieve this, the emergency services sector will need to take a more proactive approach to building capability and capacity across all hazards and all agencies rather than focusing on building capability for a specific hazard following a major incident.*

The VFR agrees with these VICSES comments. When it comes to building capability and capacity it is understandable that recent incidents may tempt incident specific remedies. However, a more strategic and overarching approach should be applied to consider such matters from a whole of government, maximum scalability perspective, with the objective of enhancing capability for all types of emergency events. Consistent with this approach the VFR recommends the state develop a highly trained and mobile multi-agency incident control capability to be readily available for short notice deployment anywhere in the state, for any type of emergency event. Establishment of multi-agency teams to support local control capability would ensure initial ICC establishment availability, or a relief capacity for any established ICC team contending with an event that becomes protracted.

The VFR perceives numerous benefits to such an approach. Primarily, it serves to bolster statewide control capacity and capability from an 'all hazards' perspective. It also brings agency representatives together where sector wide thinking can be applied to the exercising of control for all types of hazards and how this may best be achieved in a multi-agency configuration given the differences and distinctions in particular agency systems and processes. Once the most appropriate means have been established then relevant officials may be trained and exercised to ensure functionality, familiarity and cross agency

awareness. Multi-agency 'flying squad' control team members could then introduce such arrangements back into their particular agencies and champion their acceptance and usage to encourage standardisation of processes thereby enhancing joined up capability sector wide.

The VFR notes that for bushfires the concept of pre-formed IMTs has been adopted for extreme code red days so that emergency management capacity is assured and cold starts are eliminated. Establishment of a statewide, multi-agency, 'all hazards' emergency management capacity would provide similar assurance for emergencies other than fire.

The VFR strongly reinforces the advice it provided to the SC&MC Bushfires Sub-Committee on 5 April 2011 that this lack of incident control capacity must be addressed urgently.

#### **Recommendation 45:**

The VFR recommends that:

the state, as a matter of urgency, develop a multi-agency Incident Control Team capability to be readily available for statewide deployment to establish incident control or to relieve functioning control structures.

#### **Overview of command and control issues**

As already highlighted, while Victoria's command and control arrangements seem satisfactory for small, everyday types of emergency events, the scale and duration of the 2010–11 flood events have exposed serious inadequacies when it comes to the management of large scale and protracted emergencies.

These floods required control structures to be established and maintained at many locations and for protracted periods, with such requirements grossly exceeding the stand-alone capacity of the control agency, VICSES. VICSES advise that at the peak of the floods, control was being exercised at state level, four regional levels and at eight incident levels. This does not include various other locations where CFA volunteers were in effect acting independently of VICSES, putting in place control structures to manage local flood events. Examples illustrating this will be detailed in case studies to follow.

In the absence of VICSES control and response capacity, what evolved was a variety of arrangements whereby personnel from other agencies also performed flood control and response roles. Uncertainty existed due in part to an absence of prior training and exercising of the arrangements that eventuated.

Fire agency control centres were utilised by VICSES staff who were not routinely familiar with such facilities and in any event these centres did not readily support VICSES IT functioning. Differing agency systems and processes were not integrated which served to complicate multi-agency operations. No effective cross agency communications system existed. Pre-existing flood plans either did not exist, were not known of or were unavailable at many locations. In many areas incident action plans were not readily issued to direct response activities.

At the incident or VICSES Divisional Command level, VICSES volunteers were expected to put in place control structures. They had not been trained to do so and in any event did not have the necessary resources available to them. Many flooded locations had no presence from the control agency and the control agency at best had limited means to monitor developments at such locations. Not surprisingly, from a command and control

perspective, there were breakdowns at many levels. At many locations there was cause to question if effective control had been established.

### **Command and control capacity within the flood control agency (VICSES)**

The nominated control agency for floods in Victoria, VICSES, has about 5,500 volunteers and 125 paid staff. VICSES is regionally structured and has 31 units located in the metropolitan area and 122 rurally located units around the state.

Although many agencies assisted with responding to the floods, the CFA played the most substantial role and this is hardly surprising given the spread and extent of its resources. The CFA has more than 60,000 volunteers and about 1500 paid staff, operating out of 1213 brigades across the state.

### **Case study – Mount Beauty and Tawonga**

In the adjoining townships of Mount Beauty and Tawonga there is no VICSES presence, however, a volunteer CFA brigade services each town. Two main rivers and a number of smaller streams converge at times of heavy rain and impact directly on these townships. Rainfall impacts can be compounded by other factors including Falls Creek snow melts (when snow is present) and dam overflows from three dams on the East Kiewa River. Recognised flood risk areas include the Mount Beauty Hospital, certain residential and commercial areas and also the Tawonga Caravan Park. Resident isolation is also an issue due to impassable and flood damaged roads. Local flooding can also serve to isolate the townships meaning there will be a reliance on locally based emergency services until access may be available for those from outside areas.

The volunteer brigades report that for more than 20 years they have responded to localised flooding events without any formalised flood plans existing. In the absence of any such plans and in order to better inform and guide the CFA flood responders, the Mount Beauty CFA has developed its own flood response plans. Such plans detail triggers, sources of intelligence, appropriate response actions and anticipated impacts, necessary interventions and timings for actions, as well as more general response related matters.

Between September 2010 and February 2011, the Tawonga and Mount Beauty areas were flooded to varying degrees, on several occasions. There were five separate instances of the CFA having to undertake flood mitigation works at the Mount Beauty Hospital. Local CFA brigade members praised the efforts of VICSES personnel for conducting an informative flood information public meeting in Mount Beauty prior to the first (September 2010) flooding event. However, from that point onwards these brigades detail only limited contact with VICSES and during one instance of flooding, no contact at all with the VICSES control until after the floodwaters had receded.

Of their own volition and without control agency direction, CFA flood responders undertook a variety of works to protect their community. This included assisting local residents, sandbagging, constructing temporary levees and putting in place necessary road closures. The major issue these brigades reported is the inability to maintain effective communications with the ICC to provide and receive information.

These brigades also advised that many local residents recognise that the CFA provides the only flood response capacity and accordingly these locals will not even attempt to contact VICSES when assistance is required, instead they make direct contact with the CFA.

These volunteer CFA crews acknowledged they are not equipped to do flood response work and their issue gear is not suitable for such purposes; to the contrary it is considered to be dangerous for use in flood environments. They have not been trained to undertake flood mitigation activities such as sandbagging or water rescue. They also operate with a degree of uncertainty as to their authority and potential personal liability when it comes to exercising control powers such as closing of flood affected or threatened roads.

At the many locations visited by the VFR, the preparedness of CFA and other agency personnel to assist when floods may impact was readily apparent. At the community meetings conducted, there was a general awareness of a lack of VICSES capacity and a high degree of public expectation that other agencies, such as the CFA, would readily assist. Given this CFA preparedness to assist, and public expectation that assistance will be forthcoming, it is of concern that the CFA is neither equipped for, nor trained for flood response work albeit that in some locations CFA effectively serve as primary flood responders.

Evidence sourced by the VFR indicates that the Mount Beauty and Tawonga CFA experiences were not isolated accounts. The VFR heard from a number of CFA brigades expressing concern that although VICSES was the nominated control agency for flood events, in reality VICSES had no local presence and it was the CFA and other agencies who actually provided a local flood response.

CFA brigades that provided flood responses to townships such as Carisbrook and Beulah also detailed their perceptions of a lack of control being established by VICSES and an absence of any direction being provided concerning flood response activities. The VFR has heard various accounts of strained relationships between CFA flood responders and VICSES control staff during response phases.

### Case study – Carisbrook

In the township of Carisbrook, 298 homes were inundated by flood waters. In its VFR submission Central Goldfields Shire advise that the Carisbrook community rallied around the local CFA station as this was the only recognisable point for flood emergency activity. The Carisbrook CFA submission to the VFR details its efforts to assist their township and expresses concern that at no stage was any physical assistance or equipment provided by VICSES. This volunteer CFA brigade consists of 20 active members and 16 of these had their own homes flooded over the course of these events. There is no VICSES presence in Carisbrook and the nearest VICSES unit is based at Maryborough, some eight kilometres away. Carisbrook CFA advised how at its own expense it arranged for supplies of sandbags and sand to be available at the CFA station for Carisbrook after encountering difficulties with securing these via VICSES.

This brigade also describes how, in the absence of any VICSES plans or direction being provided, it devised and implemented a control structure and then undertook activities including planning for and undertaking evacuations considered necessary. Of most concern to these CFA volunteers was that they often bore the brunt of blame from community members who perceived that not enough was being done to protect Carisbrook when it was VICSES and not the CFA who was the designated control agency for flood events. The CFA advised that VICSES representatives did make a couple of brief visits to Carisbrook, however no assistance or direction was provided and that the initial local flood response was left entirely for the CFA to contend with.

The inability of VICSES to fulfil their responsibilities as the control agency for large scale and protracted flood events is understandable given VICSES has a total of only nine certified level 3 incident controllers it can call upon to assume all level 3 controller roles required to be filled at all necessary locations across the state. By way of comparison, the CFA has about 100 level 3 controllers available. However, it is not just controller or other ICC functional cell leader roles where capacity issues exist within VICSES. Views expressed by a collective of Victorian municipalities highlight broader concern:

*MAV members reported a number of significant issues with the SES, including accessibility, capacity and resourcing during the 2010–11 flood events. Councils report that local SES units had little or no capacity to fulfil their role as the control agency. In one municipality, the sole SES unit had only seven volunteer members, with no ability to take command and control at the local level.<sup>167</sup>*

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167 Municipal Association of Victoria submission to VFR, 27 May 2011

Various councils made submissions to the VFR also expressing concern about the capacity of VICSES. Loddon Shire submitted:

*The VICSES was overrun by this event at all levels. Locally the VICSES has eight volunteers, all capable people from Loddon Shire. However, being the only unit in the shire, they were simply not able to provide the range of services expected. Loddon Shire had 13 small townships impacted by the flash flooding or flooding of the Loddon River.*

Buloke Shire submitted:

*The 'control' of the response to the January 2011 flood event was not evident during the most critical part of the emergency. The inability to communicate with the ICC at Bendigo clearly made it difficult for additional SES resources to be provided to the shire and the local SES was seen to have struggled to fulfil its control role or meet demands for assistance.*

Even at some locations that were serviced by a VICSES unit there was insufficient agency capacity to establish effective control arrangements and in the absence of this alternate means of control evolved. (Refer Mildura case study on facing page.)

Mildura Rural City Council provided the following comments concerning these flood events:

*Difficulties were experienced with the ICC initially being based in Bendigo and dealing with nine local government areas (Mildura being the 10th). The ICC was eventually moved to Swan Hill as a level 2 ICC. There is a perception from several members of the MECC that there was a lack of appreciation of the seriousness of the flash flooding event in Mildura by members of the ICC. The result of this was a perceived lack of strategic planning and direction that was only addressed with the introduction of the taskforce. There is also general consensus that the most appropriate response in Mildura would have been to establish a level 3 ICC in Mildura. However, the longevity of the event would have stretched the service capacity in Mildura to maintain a level 3 ICC.*

The VFR concurs that a control structure was required in Mildura and that establishment of such a structure would have proved challenging given local resource availability. The VFR considers that this provides further evidence for the need for a state based 'all hazards' multi-agency incident control team to be established and available for rapid deployment to implement effective control structures for such situations.

VICSES did not establish effective control in, or elsewhere, for Mildura. The small Mildura VICSES volunteer presence worked tirelessly in responding to local requests for assistance and they were greatly assisted by other agencies. However, the extent and consequences of this Mildura weather event warranted an active and formal local control structure being established to determine, implement and strategically manage response activities. In the absence of VICSES attending to this, the local MECC stepped in to become the control focal point.

The VFR also received submissions from a number of VICSES volunteers expressing concern that they were required to act as leaders of VICSES Divisional Commands (the incident level of control) yet had not been trained or given any direction to perform such roles.

Other concerns common across VICSES volunteer submissions included the scarcity of VICSES staffing leading to a common practice for staff to remain on duty for excessive periods, even working to the point of exhaustion.

Of significant concern were accounts of VICSES volunteers being the target of negative community sentiment, which they perceived to be a direct consequence of the lack of VICSES capacity to manage and contend with the floods.

There is a pressing need for a rethink of the state's emergency management arrangements when CFA and VICSES volunteers committing their time and efforts to protect the state become the focus of negative community sentiment. Victoria can ill afford to disenfranchise its emergency service volunteers who are relied upon so heavily as such a critical component of the state's emergency management capability. Similarly, Victoria cannot afford for strained relationships to develop across its emergency service agencies in regard to particular agency capabilities and responsibilities when what is readily required is arrangements that maximise joined up capability.

## Case study – Mildura

The rural city of Mildura and surrounding townships have a resident population of about 53,000. Mildura supports a variety of irrigated farming activities and allied industries. It is also a popular tourism destination. Mildura is somewhat isolated from other large regional cities and the support that these may provide.

The Mildura area usually experiences average annual rainfalls in the vicinity of 200mm. As a consequence of a severe weather event late in the afternoon of Friday 4 February 2011, Mildura and surrounding communities experienced rainfalls of about 147mm falling over several hours. This severe weather event caused widespread flash flooding which impacted many properties. While Mildura had previously experienced riverine flooding, a flash flooding event of this magnitude was unprecedented. Evacuations and rescues became necessary and a relief centre was established. Flood impacts extended to major highways and critical local infrastructure, such as power substations. Topographic and drainage issues meant that waters pooled in a variety of locations and did not readily dissipate. Concerns also arose in regard to sewage leakage into other water systems, threats to power supplies and these jeopardising household water services. Broader health concerns developed as pooled waters turned stagnant.

VICSES has a small volunteer unit in Mildura and was able to muster 15 volunteers for the flood emergency response activities. By contrast, in terms of agency size, the CFA in Mildura consists of 15 paid staff and 78 volunteers.

As this event developed, the 15 Mildura VICSES volunteers had to contend with more than 300 requests for assistance, with hundreds more requests being logged in subsequent days. On Saturday 5 February 2011, Mildura VICSES was offered assistance from the South Australian SES but this offer was declined. However, at about midday on Sunday 6 February 2011 it was decided that assistance from the South Australian SES was needed and requests were made to secure this.

On Saturday 5 February 2011, a MECC was established at the Mildura Council premises. Other stakeholder agency representatives, such as water and CMA personnel also set up operations at the MECC to assist response activities. The local VICSES volunteer unit controller became the VICSES representative at the MECC. This was in addition to his other responsibilities to coordinate local VICSES activities in responding to requests for assistance and as the VICSES divisional command leader.

Police at the Mildura MECC contacted VICSES incident control at Bendigo on Saturday 5 February 2011 and left messages, which they report went unanswered. This already complex and confusing event was further complicated due to uncertainty within the MECC as to whether VICSES incident control for the Mildura floods was actually being exercised from Bendigo, or from Swan Hill. VICSES advised that incident control for the Mildura event moved from Bendigo to Swan Hill some time on 5 February 2011. Knowledge of this was not known across other agencies and such arrangements were not clearly articulated in available incident action plans.

On Sunday 6 February, during the early morning MECC briefing, VICSES advised that more than 100 of the requests for assistance dating back to Friday and Saturday were still outstanding and that it was hoped that many of these would 'self rectify' as the weather improved.

The VICSES Loddon Mallee incident action plan for the period 1900 hours on 5 February 2011 to 1900 hours on 6 February 2011 states that the Mildura flood events had generated more than 500 calls for assistance. When it comes to detailing strategies and tactics for dealing with the Mildura flooding, this incident action plan states:

"... as required – respond to activates (sic) based upon resource availability."

Planning to respond to requests for assistance as resources may permit hardly demonstrates an incident control appreciation of the Mildura events, nor does it constitute an effective and strategic approach to risk assessing, guiding and prioritising response activities.

In the absence of VICSES control capacity, the Mildura MECC became a pseudo control centre for the Mildura flood events directing the necessary response activities consistent with community needs.

Given the internal emergency management limitations of VICSES, it is expected that well ingrained, tested and exercised scale-up arrangements would exist enabling VICSES to utilise other existing emergency management capacity within Victoria at times of need. Broadly speaking, such arrangements were not in order. Aside from a lack of multi-agency exercising there were other significant issues that served to compromise the effectiveness of joined up agency operations. These include legislative impediments to utilising other agency staff in flood control roles and the interoperability issues spoken of (these issues will be elaborated on in sections to follow).

VICSES, as a relatively small and largely volunteer based organisation, is entrusted with significant responsibilities as the state's nominated control agency for floods. The size and scale of these recent flood events demonstrated that VICSES has capability and capacity limits that may quickly be exhausted. The VFR notes that VICSES is also the nominated control agency for other incidents such as tsunami, earthquake and storm, any of which may have significant impacts and require a substantial and protracted response. Recent events in New Zealand and Japan demonstrate the potential impacts of such hazards and illustrate the need for assuredness that arrangements for the management of large scale emergencies are in place, appropriate and functional. Based upon the experiences of these flood events the VFR is not confident that Victoria can be so assured.

The VFR recognises that all designated emergency response agencies will have limits in regard to their capability and capacity. However VICSES is entrusted with designated control agency status for a number of potentially significant major emergency event types, yet has limited internal capacity it may call upon. Formalised scale-up arrangements for 'beyond capacity' events also appear to be lacking as do trigger mechanisms serving to alert to when capacity thresholds are nearing and alternate arrangements may be required.

Given these concerns, the VFR considers that a capability and capacity assessment analysis is required to determine the extent of capability of all of the state's recognised control agencies to ensure that where necessary scale-up arrangements are in place for events that may extend beyond agency capacity. This must also involve consideration of the many inhibitors that currently exist in regard to joined up agency operations and determining means to overcome these. This concept is reflected in figure 18 (on facing page).

It is of significant concern that at present, the state has no active mechanisms to assess that agencies with designated 'control agency' status for various types of emergencies actually have the capacity and capability, either solely or in pre-arranged collaborative format with other agencies, to fulfil their obligations should they be called upon to do so.

The EM Act provides for the appointment of an ESC who has a statutory responsibility to both set and monitor standards to be adopted by all emergency service agencies for the prevention and management of emergencies.<sup>168</sup> It might be envisaged that such standards, first and foremost, would require emergency service agencies to demonstrate their capability and capacity to manage an emergency for which they are recognised as having control agency status. This is not the case. The requirements for standards have existed since the year 2000. However, the only standards that have ever been set concern the operation of the Emergency Services Telecommunications Authority. No standards are in place for any of the nominated emergency control agencies such as VICSES.

The VFR asked the OESC how it monitored statewide capacity to sustain ICC functions (from a multi-agency perspective). OESC advised the VFR that such matters were not currently assessed. (Issues related to assurance mechanisms will be further discussed in Chapter Six.)

#### Recommendation 46:

The VFR recommends that:

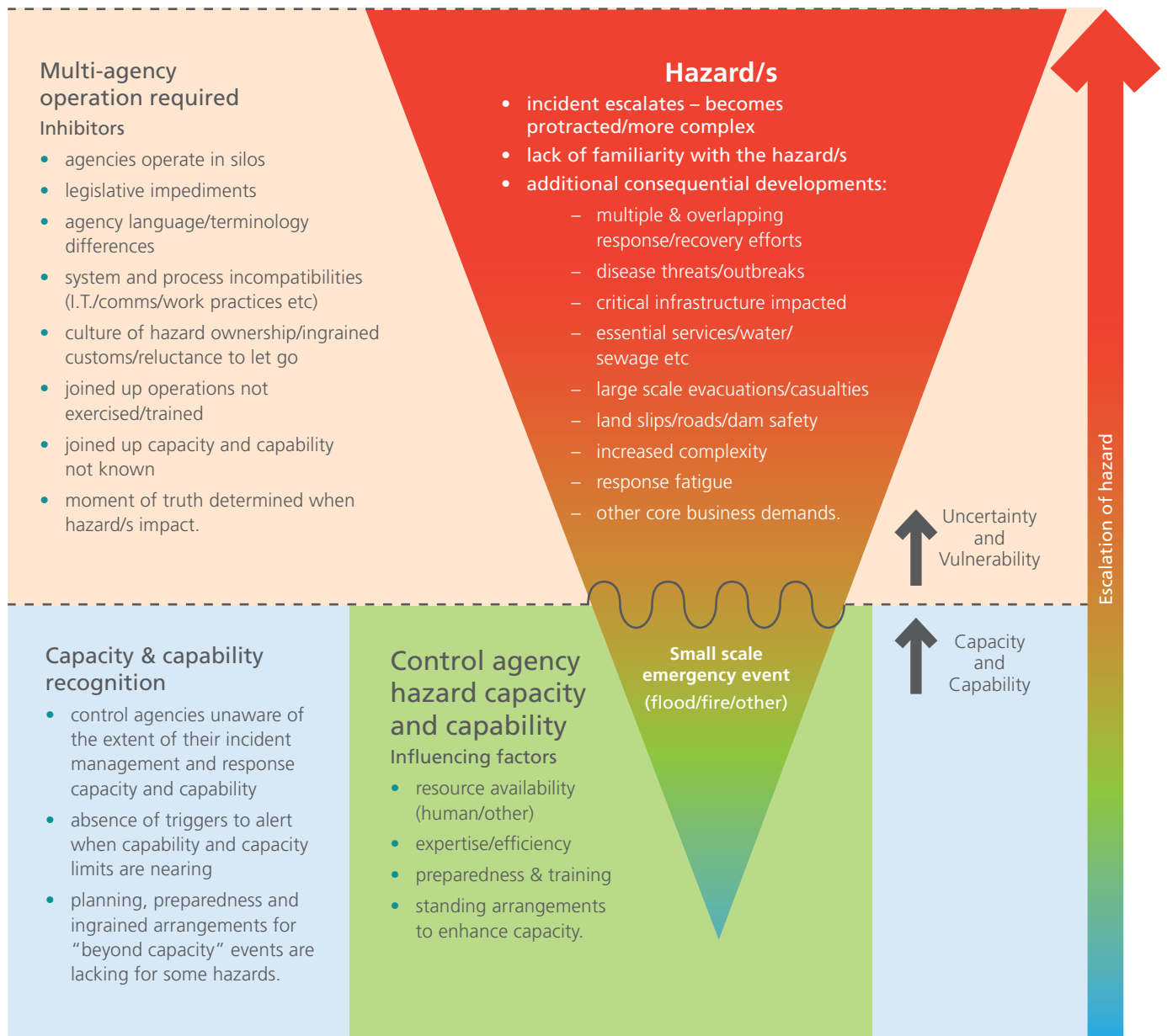
the state develop and implement operational performance standards for each state agency involved in emergency management response and recovery and that:

- each agency be assessed by the Emergency Services Commissioner periodically against these performance standards for both capability and capacity; and
- where performance against these standards for either capability or capacity cannot be demonstrated by any agency
  - appropriate advice is communicated to the relevant Minister, departmental/agency head and State Emergency Response Coordinator; and
  - an action plan is developed and implemented to address the relevant capability or capacity deficiency in both the short and longer term.

<sup>168</sup> Emergency Management Act 1986 s. 21C



Figure 18 – Agency capability and capacity and the hazard scale (VFR – 2011)



## Specific command and control issues

### Interoperability

In all of the debriefing sessions conducted by the VFR, both at regional and state level, an issue of significant concern was interoperability. This was a reference to each agency having separate and incompatible information management and communication systems effectively meaning that agencies were operating in silos and were not readily able to communicate or share information. Non-standardised operating procedures and work practices across agencies added further complexity and were said to have impeded the capacity of agencies to work together.

### Communications

It was commonly reported to the VFR that VICSES response crews had no radio communications with their control centres. While VICSES does have a radio system, the effective coverage of this system was described as poor. Response crews from other agencies, such as the CFA and DSE similarly could not communicate with the ICC as their agency radios were not compatible with VICSES radios. In the absence of any workable alternative, personal mobile telephones routinely became the communication tool, however this is not without issue. A mobile telephone conversation involves two parties only and does not provide for involvement by others who should be a party to, or may be able to add to, such information. There are also capacity issues associated with mobile telephone usage and the VFR often heard of responders being unable to make mobile contact with those at control centres, getting engaged signals or telephones ringing out, or even leaving messages that would go unanswered. Mobile networks can also overload, as can be anticipated when an emergency event arises and usage rates escalate. The EA system described in the previous chapter was also said to have had a significant impact on mobile telephone networks with reports that when an EA message was issued, mobile telephone networks in the particular area would be jammed and unusable for approximately 15 minutes.

#### Recommendation 47:

The VFR recommends that:

the state commit to securing effective multi-agency interoperable communications as a high level priority and that all future communications projects and upgrades incorporate compliance provisions mandating interoperability requirements.

### Resource management systems

The VFR heard that VICSES resource management systems were not compatible with the systems of CFA or DSE. In essence, the VICSES system could not be accessed by non-VICSES personnel assisting in resource officer roles. A number of resource officers reported to the VFR that these system issues meant that they could not effectively perform their roles as they would be unaware of personnel who had been deployed, what their welfare needs may be or when relief may be required. Multiple systems were often utilised as no single system catered for all multi-agency operations.

#### Recommendation 48:

The VFR recommends that:

the state ensure that common and interoperable resource management systems are developed and implemented by emergency management agencies. Common systems should be utilised to the fullest extent possible.

### Incident management systems

Functional cell leaders in incident control structures were often drawn from agencies other than VICSES, for example CFA, DSE and MFB. A commonly reported frustration for such leaders, and their supporting teams, was that the VICSES IMS being utilised was not the IMS that they were accustomed to. This was claimed to have caused confusion as to roles, expectations and responsibilities. While the VICSES IMS was said to be slightly different to the version run by other agencies, according to AFAC, this is to be expected.

AIIMS, the AFAC IMS product utilised by VICSES, CFA, DSE, VicPol and MFB, does not prescriptively detail how an incident should be managed and it is recognised that different hazards will require different approaches. AFAC consider that the key to interoperability, from an IMS perspective, is for agencies to get together to exercise emergency scenarios so that they become familiar with the means by which other agencies manage emergency events within the AIIMS framework. This issue will be further discussed under the 'Training and Exercising' section within this chapter.

#### Recommendation 49:

The VFR recommends that:

the state ensure that sector wide familiarity and understanding of the various systems for incident management is developed and maintained. Primarily, this should be achieved through multi-agency emergency management training and exercising involving usage of the various agency incident management systems.

### Information management processes

In addition to the IMS utilised by agencies, all agencies will have information management processes in place to provide for the collection, analysis and sharing of information. Again, there is wide disparity across agencies concerning arrangements and in the absence of any sector wide direction, different systems have been embraced. Ambulance Victoria use a web based program known as Noggin, VicPol use a web based program known as WeB-EOC or PEEC, while DSE utilise a web based program called FireWeb which the CFA can also access. The web based VICSES Operational Incident Management System (OIMS) is utilised by VICSES to manage requests for their assistance. However, OIMS is not considered to be effective for broader information management purposes. Consequently, VICSES rely on maintaining logs, utilising telephone calls, faxes, SMS and emails. Frustrations were expressed at ICCs concerning these disparate arrangements across agencies, which effectively meant that information could not be readily shared. The VFR routinely heard that IT systems within control centres were not user friendly for multi-agency operations, with difficulties experienced with data exchange, managing large electronic files such as those containing mapping and even with printing. In some locations saving files to USB device and then physically conveying these elsewhere was described as the only possible means to exchange electronic information.

#### Recommendation 50:

The VFR recommends that:

the state ensure that interoperable information management practices are developed and implemented by emergency management agencies. Common systems should be utilised to the fullest extent possible.

### Records management issues

A consequence of the multi-agency and multi-system functioning of ICCs was that flood related records were maintained on a variety of different agency systems. The lack of a common operating system across agencies working in ICC roles means that the VFR has been unable to determine with certainty what roles were fulfilled by whom and when in contending with these flood events. Post event validation of roles, responsibilities and specific actions by reference to agency records remains problematic.

The VFR understands that VICSES has informal arrangements in place with CFA and DSE to access their systems post event to retrieve records and that VICSES intend on securing formal agreement for this. The need for the cataloguing and capturing of all emergency incident records cannot be overstated given the likely requirements for such information by forums such as royal commissions, inquests, or inquiries such as this flood review. This adds further weight to the need for formalised information management arrangements and a common platform across agencies for file and information sharing and retention.

#### Recommendation 51:

The VFR recommends that:

the state ensure that appropriate record management processes are developed and implemented and that these processes also provide record accountability for multi-agency operations. Agency processes should be standardised to the fullest extent possible.

### The state control centre

While interoperability shortcomings might be expected to be encountered when a multi-agency group is hastily convened at a rurally located ICC, interoperability issues were even more prominent at the SCC.

The SCC is the venue from which state level command, control and coordination is exercised. This dedicated facility with permanent management staff in place, is activated for emergency events having state level significance.<sup>169</sup> The state controller, who is to provide strategic leadership for the resolution of the emergencies across Victoria, is based at the SCC.

<sup>169</sup> Victoria Police maintain its own control centre which it will utilise instead of the SCC for certain types of emergency events (for example terrorism threats or activities)

Concerns as to SCC interoperability are highlighted in the following observations extracted from a DSE submission.

*VICSES email and electronic data systems are not integrated with the SCC system of DSE and CFA. Meaning that they (VICSES) did not use SCC generic email addresses and much information had to be sent by email rather than stored and retrieved from a common drive. DSE flood management unit staff had similar issues because they needed to access information on the common cross agency R-drive or FireWeb.*

and

*Interoperability of IT systems is a major issue for the SCC. VICSES and DSE IT are currently not interoperable.*

Differing agency IT systems posed concerns at the SCC also. Obtaining a statewide overview of the flood events would potentially entail interrogation of multiple systems as outlined in the attached comments provided by SCC facility management:

*The SCC experienced significant issues with the ability at state level to gain a true picture of what was occurring on the ground. This is mostly due to the lack of interoperability between each agency's incident management IT systems. This inhibited our situational awareness and in turn I believe inhibited quality information being fed to the community. There is a strong need for the emergency services in this state to develop a system which we all use to enable better exchange of info between agencies and to the community.<sup>170</sup>*

At a VFR debrief for state level operations, senior agency representatives suggested that the state lacked the strategic vision required to provide for interoperability in an 'all hazards' environment and in the absence of this vision, individual agencies continued to invest to enhance their own agencies' capabilities. The VFR heard:

*Within the SCC there are currently seven different and incompatible incident management systems utilised and five different and incompatible teleconferencing systems. The public would be shocked to learn that at state level operations, systems issues mean that we can't even talk to each other and can't share information.*

Even the telephone system at the SCC drew criticism. The VFR heard:

*We are still running multiple telephone and email systems for incidents, these often disallow information sharing, for example, email attachment size limits for exchange of maps and incident action plans. To call a VICSES telephone in the SCC from a CFA telephone in the SCC you first need to dial out for an external line.*

Concerns as to the existence and incompatibility of disparate agency systems have been long held. A report to government on the 2002–03 Victorian Bushfires commenting upon the coordination of emergency response, advised:

*First, the information systems employed by the agencies are different. This can restrict the ability of officers to access and share available data, and can hide any discrepancies in information. Given that this information is the basis of joint decision making by the agencies, it can affect the quality of decisions taken.<sup>171</sup>*

It would appear that interoperability issues identified more than eight years ago have not as yet been remedied and continue to compromise exchange of information.

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170 Advice to VFR from SCC Management 11 April 2011

171 State Government of Victoria, 2003, Report of the Inquiry into the 2002 – 2003 Victorian Bushfires p 183

### Recommendation 52:

The VFR recommends that:

the state ensure, as a matter of priority, that the State Control Centre is able to function as a fit for purpose, multi-agency emergency management centre. Necessary works to achieve this outcome should have an overarching focus on the implementation of common agency systems and processes to the fullest extent possible.

## Ensuring interoperable procurement

Securing and maintaining effective control of an emergency event is contingent upon those contending with the emergency having the means to remain cognisant of all developments, thereby being able to adapt their efforts accordingly. A specific term used within the emergency management sector to reflect this is 'situational awareness'. In the context of a flood event situational awareness may be secured via many sources. Examples include the sharing of weather and water flow related data and mapping, and reports from on the ground observers. However, most critical to securing situational awareness is the free flow of information from the incident scene to the control centre.

Emergency management practitioners cannot be expected to provide the best possible information to the community if they cannot communicate effectively among themselves while they are contending with the emergency. Victoria invests about \$170 million per year on emergency services communications<sup>172</sup> yet fundamental shortcomings continue to exist in regard to interoperability. This continues to compromise the effectiveness of emergency response consistent with community needs and creates risk for those performing emergency response duties.

Under section 21C of the EM Act, the ESC is empowered to advise, make recommendations and report to the Minister on any issue in relation to emergency management. The Commissioner is also to encourage and facilitate cooperation between agencies to achieve the most effective utilisation of all services. However, the existence of these provisions has not prevented the growth and further development of disparate agency systems, seemingly procured with little regard to effective joined up agency capability.

An 'all hazards, all agencies' approach to emergency management will be contingent upon agencies embracing interoperable systems and processes so that actual multi-agency service delivery can be effectively achieved. The continued adoption, usage and development of disparate systems serves as a significant impediment to achieving effective multi-agency capability.

### Recommendation 53:

The VFR recommends that:

the state ensure that any new systems and equipment purchased by state emergency management agencies are interoperable with other relevant agencies to the fullest extent possible. This should involve the state establishing a procurement gateway process with input from the Emergency Services Commissioner.

## The coordination role

Under Victoria's emergency management arrangements the emergency response coordinator role is always performed by VicPol. The SERP defines coordination as the bringing together of agencies and resources to ensure effective response to and recovery from emergencies. Coordinators operate at various levels. At the scene of the incident, the senior police officer present will be the Field Emergency Response Coordinator (FERC). Each municipal district will have a police officer assigned as the Municipal Emergency Response Coordinator (MERC). Each police region has a Regional Emergency Response Coordinator (RERC), who may be assisted by delegates. At state level the Chief Commissioner or senior officer delegated by the Chief Commissioner will perform the role of State Emergency Response Coordinator (SERC).

The SERP lists principal roles for Emergency Response Coordinators at all levels outlining various accountabilities.<sup>173</sup> Importantly, coordinators at all levels are required to ensure effective control has been established by the control agency in response to an emergency and to ensure that the control agency is focused on key matters such as issuing information and warnings for the affected community and other agencies working in support roles. Coordinators are also to attend to resource requests of the agencies contending with the emergency and have statutory powers that enable them to direct agencies concerning resource allocation for emergency response purposes.

<sup>172</sup> Department of Justice *Review of Existing Emergency Service Support Arrangements*, CDL & Associates, January 2011

<sup>173</sup> State of Victoria, *Emergency Management Manual* Victoria, 2011, p 3-21

In addition to outlining generic coordinator roles, the SERP then details specific roles applicable to the various level coordinators that may operate over the course of an emergency event, namely the FERC, MERC, RERC and SERC.

The VFR considers that the most critical accountability for a coordinator is the required focus on ensuring effective control has been established by the control agency in response to the emergency. This quality assurance mechanism should act as a failsafe to identify break downs in control and to bring about any remedial action necessary. It is also considered that in order to discharge this accountability, a coordinator will require a strong and contemporary understanding of emergency management arrangements and a continued presence at the location where control is being exercised. Also helpful would be a degree of local knowledge for the emergency affected area.

The VFR does not consider that a coordinator could effectively perform this function remotely by using technology, or via use of a proxy such as liaison officer representation. Furthermore, the VFR does not consider that this is a responsibility that could be considered to be fulfilled until the response component of an emergency has concluded. Effective control may well be established in the early stages of an emergency response, however this can quickly break down as new challenges or developments present. The VFR considers that this accountability to ensure that effective control has been established should be extended to ensure that control is maintained. Accordingly, and in order to achieve this, a coordinator must maintain a presence where control is being exercised until the response phase concludes.

The VFR has learned of an instance where a coordinator at an ICC rightfully intervened to stimulate action considered necessary to ensure effective control was established. The VFR is aware of other examples suggesting coordinator intervention was warranted, but did not materialise. In some instances a coordinator presence was not maintained where control was being exercised at the ICC.

A primary focus for incident controllers in establishing effective control will be the timely compilation and distribution of an Incident Action Plan (IAP). An IAP will provide guidance and direction to all involved in the emergency event and afford structure and organisation to emergency response activities. An IAP will detail who is in charge, where they may be located, what needs to be done, by whom, how it will be achieved and in what order of priority. The VFR is aware of many examples of IAPs being unavailable, inadequate or not prepared at all. This points to a breakdown in effective control which should trigger intervention via the coordination function. It would appear that this did not routinely occur (IAPs are further addressed in the emergency response planning section of this chapter).

The SERP does not specify that any particular coordinator will attend at the place where control is being exercised and it may be considered problematic to do so. However, the VFR has concerns that as long as arrangements for ensuring a coordinator presence at a control centre are not articulated, then ad hoc arrangements will exist, thereby creating potential for confusion, misunderstanding and neglect of this most critical responsibility which provides a failsafe in the arrangements. The VFR notes that the FERC will be at the scene of the emergency, the MERC is to attend at the MECC, if activated and that this may be remote from the ICC. The state level coordinator will be at the SCC and will be dependent on advice from lower level coordinators that effective control has been established. The RERC, or delegate, remains as the likely coordinator capable of monitoring the exercise of control where this is occurring.

There are also language issues in the SERP relative to the listing of principal roles for emergency response coordinators. The requirement to ensure that effective control has been established by the control agency and ensuring that the control agency is issuing warnings and information in the context of the flood events carries with it the implication that the control agency is attending to all such matters. While the designated control agency for floods is VICSES, in reality, in the 2010–11 flood events staff acting in control roles and those issuing warnings were often from other agencies and not from the designated control agency. For these provisions in the SERP to be compatible with the 'all hazards, all agencies' philosophy, they should be drafted in a manner that recognises that those performing such roles may not be from the designated control agency.



#### Recommendation 54:

The VFR recommends that:

Victoria Police revise coordinator arrangements to ensure:

- a coordinator presence is maintained at the place where incident control is being exercised
- effective control is established and is maintained until the response phase has concluded
- key control roles may be performed by personnel from agencies other than the designated control agency
- that the timely compilation and distribution of an appropriate Incident Action Plan is recognised as a fundamental component of establishing effective control
- those performing the coordinator role at an Incident Control Centre be suitably trained, skilled and experienced in emergency management and where possible possess a degree of local knowledge of the relevant area; and
- that the revised coordinator arrangements are reflected within the State Emergency Response Plan.

#### Other mechanisms for ensuring 'effective control'

Following the Black Saturday bushfires, VicPol established what is known as a Strategic Emergency Management Assurance Team (SEMAT) process. SEMAT may be deployed by the SERC or delegate and provides another means for the SERC to ensure that appropriate emergency management arrangements have been put in place and effective control has been established. While initially SEMAT was developed and deployed in regard to bushfire events, the VFR notes that SEMAT was also utilised for the September 2010 flood events when it was deployed to the Shepparton and Wangaratta areas. The VFR understands that SEMAT's future focus is to be 'all hazards' and not restricted to either fire or flood.

Since its implementation, SEMAT has been deployed on 18 occasions to observe and report on control and coordination functions during the preparation and response phases of emergencies across Victoria. SEMAT has reported on a range of issues including opportunities for improvement through to evidence of good practice across agencies. SEMAT findings are provided to all stakeholders.

SEMAT acceptance and understanding has been an issue to date with some agencies said to be quite cautious of the process. A recent SEMAT review has suggested broadening of the SEMAT team makeup so that where appropriate it may involve subject matter experts (SME) from the particular control agency managing the emergency event. Numerous benefits are perceived from such inclusion. These include:

- affording SEMAT a greater understanding of the control agency's policies, practices and procedures
- providing an ability to clarify control agency arrangements with minimal disruption to operational personnel
- improving inter-agency knowledge, understanding and relationships
- engendering greater acceptance and understanding of the SEMAT role across agencies as a coordination related function as opposed to a policing function
- encouraging greater consistency in agency approaches to emergency management review and monitoring.

The VFR notes that other agencies have a variety of operational activity assurance mechanisms. The CFA has what is known as Real Time Performance Monitoring, while VICSES is developing an Operational Performance Monitor capability. The SEMAT process is complementary to and does not replace these internal agency mechanisms.

The VFR endorses these future directions for the SEMAT process and considers that the involvement of SMEs from stakeholder agencies will afford broader thinking within and greater acceptance of this valuable assurance mechanism.

#### Recommendation 55:

The VFR recommends that:

the State Emergency Response Coordinator further develop the Strategic Emergency Management Assurance Team process by involving subject matter experts from relevant emergency management control agencies who are the subject of Strategic Emergency Management Assurance Team focus.

## Incident control centres

An ICC is the location where the Incident Controller and members of the IMT provide overall direction of response activities during an emergency.

As the flood incident increases in complexity, significant demands will be placed upon the facilities and communications utilised by the incident controller and other members of the IMT.<sup>174</sup>

The key responsibilities and activities that are managed from an ICC (as outlined in the VICSES AIIMS training manual) include:

- develop an appropriate structure to manage the flood response
- ensure an effective transition from the level one incident management structure, including the insertion of key local personnel in the enlarged IMT
- develop and implement an IAP
- assess the situation, identify risks and determine priorities
- develop and implement a communications plan
- direct flood response activities within the area of operation
- maintain regular communication with personnel in the field
- task and manage resources that have been allocated to the ICC
- monitor and review safety and welfare of personnel
- ensure timely information flow to key stakeholders as it relates to the area of operation. The stakeholders may include other agencies, communities and municipalities
- establish effective liaison and cooperation with all relevant support agencies
- request support agency resources and material through established protocols including the MECC.

During the 2010–11 flood events a number of level 3 ICCs were established in locations across the state. With the exception of Mulgrave, all level 3 ICCs were located in either DSE or CFA venues that had been set up for the express purpose of bushfire control operations. VICSES, under a general agency agreement utilises these facilities in the event that no fire operations are being conducted.

VICSES has only two facilities deemed appropriate for level 3 operations. These are at Mulgrave and Bairnsdale (which is co-located with the CFA).

The CFA and DSE have 43 ICCs across the state that are capable of running a level 3 incident. These centres were upgraded following the VBRC findings. These ICCs have been standardised to assist in providing consistency for command and control functions during fire operations. CFA and DSE have also developed a SOP to ensure sufficient incident management capacity is in place to effectively manage fires. The fire agencies have developed staffing schedules outlining additional positions that can be filled as determined to be necessary by the incident controller.

Utilising the DSE/CFA facilities during the flood events posed various challenges for VICSES and the support agency staff brought in to assist with operations being conducted within the centre.

All DSE level 3 ICCs are normal operational DSE business premises. This becomes problematic when the ICC is activated for what evolves into a protracted emergency as DSE core business activities are impacted.

The most common concern the VFR became aware of related to ICC functionality in that the level 3 centres were set up for both DSE and CFA IT systems, but did not provide for the operation of VICSES IT. VICSES had anticipated interoperability issues should VICSES need to utilise fire service ICCs. VICSES provided a briefing to VEMC-CG on 1 September 2010 in regard to flooding anticipated in north east Victoria and advised:

*VICSES has arrangements in place to access ICC facilities of the CFA and DSE but to this point has not been funded to establish VICSES' IT networks into these facilities. As such, VICSES will be relying on the IT networks of the other agencies which poses (sic) a risk for information flows.*

Arrangements to utilise other agency ICC facilities are unsatisfactory if it is known that functionality may be compromised when the arrangements are exercised. The VFR considers that such arrangements would have benefited from a greater level of pre-planning, particularly in regard to functionality matters.

The VFR notes that since the floods, VICSES has reviewed the VICSES/Fire ICCs that would be best suited for the flood environment. This review has formed the basis for a revised VICSES funding bid to government seeking to have VICSES ICT infrastructure (systems access) supported to allow for better interoperability and access to data.

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<sup>174</sup> Victorian State Emergency Service, *Managing Floods using AIIMS – Learning Manual*, 2008

The VFR is not inclined to support the fire agency level 3 control centres being retrofitted with VICSES IT capability. While this may provide a short term solution to this issue, such actions would in effect provide for a third system to be in place at these installations. The VFR considers that this provides potential to further compound the cross agency information exchange and sharing issues so commonly heard of and would prove a poor investment. Development, installation and upkeep of disparate agency IT and communication systems must be discouraged as a means of directing agencies to common systems and processes, thus improving interoperability and 'all hazards' capability at all levels. The VFR accepts the need for VICSES control functionality at fire agency ICCs, however, means must be explored to achieve this outcome primarily by way of common systems.

#### Recommendation 56:

The VFR recommends that:

the state conduct an 'all hazards' needs analysis to determine requirements for level 3 Incident Control Centres with a focus on 'all hazards' and multi-agency capability. Following this analysis, the state take steps to ensure the availability of sufficient and functional level 3 Incident Control Centres across the state with an 'all hazards' and multi-agency capability.

### Emergency response planning

Commentary about emergency planning within this chapter is restricted to matters allied to command and control functions. Broader emergency management and flood specific planning arrangements will be addressed in Chapter Six, while evacuation planning matters will be addressed in Chapter Four.

IAPs are a critical component of emergency response and are intended to provide for the organised delivery of response activities. At many locations and in a variety of submissions the VFR heard of concerns related to IAP processes.

Every Victorian municipality is required to have in place a MEMP. If a municipality may be at risk of a particular hazard, such as a flood, then hazard specific management plans to address such risks are to be compiled. These are referred to as sub-plans.<sup>175</sup> At many locations the VFR learned that flood sub-plans either did not exist, were not known of, were unavailable or were incomplete or in draft format. The non-existence or unavailability of municipal flood sub-plans directly impacts on the capacity of ICCs to compile effective flood emergency response plans.

Incident controllers at all levels are responsible for compiling an IAP to direct emergency response activities.<sup>176</sup> Controllers delegate this responsibility to the planning cell in their IMT structures. While a state controller's IAP may be quite strategic in its focus, local level IAPs should be far more detailed to address local issues, specific actions required and the means by which these may be achieved. IAPs should also contain a communications plan and particularise the structure put in place to manage the emergency so that all involved are aware of roles, responsibilities and reporting arrangements. The IAP process is continuous and generally provides for plans to be revised at change of shift, or sooner if circumstances dictate that this may be necessary.

ICC planning cells, in order to compile the IAP, will make use of various sources of information. The VFR considers that primarily flood IAPs would be well informed by reference to pre-existing flood sub-plans in place to provide direction should a flood occur. The VFR has already highlighted that at many locations, flood sub-plans were either not available, did not exist, were not known or were incomplete.

Those compiling IAPs will also need to engage with those at incident level to gather situational updates and learn of other issues arising. As already highlighted, communications issues did not readily support such engagement.

The VICSES post flood internal review concedes that IAP usage was not widespread in the early stages of the floods, but usage increased as events progressed. This VICSES review also highlights numerous instances where Divisional Commanders and Unit Controllers did not get to see IAPs, and when they did, such plans were by then out of date or too voluminous to read. VICSES also contend that the primary reason for IAPs not being disseminated to all relevant personnel at incident level was the inability of VICSES communications equipment to send and receive IAPs electronically, particularly if they included maps.

At one outer suburban flood event, the absence of an IAP contributed to much confusion about who was actually managing the event and where control was in fact being exercised from. Cardinia Shire Council advised:

*Confusion was evident at the municipal level, the local SES appeared to be unaware that an ICC was operating out of Mulgrave. Subsequently they (being the local VICSES unit) were operating as the ICC.*

<sup>175</sup> For further information see the EMMV at page 6-8 (Specific Hazard Planning)

<sup>176</sup> State of Victoria, Emergency Management Manual Victoria, 2011, pp 3-9-10

VicPol representatives and other support agency staff at the Pakenham Emergency Services Complex have advised the VFR of their belief that management for this flood event was being exercised at the local (Pakenham) level. Agency representatives at Pakenham participated in what they understood to be EMT meetings convened by the local VICSES incident controller. Such meetings dealt with critical issues and decisions were made to evacuate a number of flood threatened townships and provide flood warnings to others. It was not until later that evening that it became known that the incident controller for this Cardinia event was actually based at Mulgrave. VicPol advise that the earlier (Pakenham) decisions to effect evacuations of certain townships were then rescinded by the (Mulgrave) incident controller. However, some 75 minutes later an EA message was issued calling for these (previously rescinded) evacuations to occur. Undoubtedly, in this event the absence of an IAP being circulated to depict the management structure in place led to confused understandings about who the actual incident controller was for this flood, where the control structure was based and from where evacuation and warning information would be authorised and issued. It would also appear that while widespread evacuations of many townships were called for, no IAP existed to underpin such activity. A regional level IAP was not issued for this flood event until the following day.

In addition to the generic responsibilities in the EMMV for controllers at all levels to develop an IAP, at state level when the SEMT is convened the State Controller (as chair of SEMT) is responsible for ensuring that a plan is developed to outline the actions for all involved agencies.<sup>177</sup> In response to the anticipated flooding, VICSES convened a SEMT meeting in the afternoon of 1 September 2010. Despite the generic requirement for controllers at all levels to develop an IAP, and the requirement for a plan to be prepared when SEMT is convened, no formal state level IAP was compiled.

Consistent with the SERP requirements for IAPs to be compiled at state, regional/area of operations and incident level, the VFR called for a sample of plans from such levels. Plans provided to the VFR indicate that flood response planning activity was restricted to ICCs which due to span of control factors the VFR considers to have been operating as regional or area of operations centres.

Noting the above, IAPs, when actually compiled, often did not contain sufficient detail for incident level operations. For example, the Loddon Mallee plan for Mildura detailed a strategy suggesting actions akin to dealing with the floods as resources permitted.

Other agency personnel also made submissions to the VFR highlighting concerns about IAPs. Examples of comments received include:

*The SES incident action plans had little in the way of strategic direction for the various divisions and sectors, that is, there were no actions identified for crews to undertake.*

and

*... no clear structures on IAPs appeared. The unit officers of planning and operations clearly did not understand their roles due to a lack of experience. Planning (cell) unable to document structure due to a lack of understanding.*

The VFR accepts that communication issues may have complicated the dissemination of IAPs by VICSES. However, various agencies have highlighted how they were able to receive facsimile messages from VICSES, yet copies of IAPs were not readily provided. Furthermore, state level plans simply did not materialise. In this regard the VFR considers that VICSES has some considerable shortcomings relative to IAP capability that cannot be excused by IT limitations.

The VFR notes that certain other agencies have well ingrained IAP capabilities that provide for electronic and handwritten IAPs to be produced in a timely manner in the early stage of an emergency response and then distributed to key stakeholders involved. The MFB, for example, utilise an electronic IAP process that succinctly details structures, strategies and tactics. In the event of power failure the MFB has a paper based back up IAP template process enabling rapid compilation and distribution of the IAP. The VFR considers that such a process could be adopted and utilised by VICSES to enhance IAP capability.

The VFR also considers that the absence of any sector wide, overarching emergency management framework in Victoria has enabled agencies to develop different IAP processes, thereby providing potential to confuse and complicate what should be a relatively simple and standardised process. A more standardised approach to IAP compilation across agencies would complement joined up agency operations.

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<sup>177</sup> State of Victoria, Emergency Management Manual Victoria, 2011, p 3-19

The VFR also considers that VICSES emergency response planning capability could be enhanced by way of preparation of a library of pro-forma emergency response plans for all levels to be kept available for localised adaptation and prompt issue when emergency events occur. However, it would be preferable for this to be done in collaboration with other agencies to ensure that best practice IAP processes were standardised to the fullest extent possible.

The absence and unavailability of effective IAPs throughout the course of these flood events led to general confusion about the management and communications structures in place and the undertaking of response activities. In the absence of an IAP it is unlikely there will be clear direction to all involved about who is in charge, where they may be located, what the objectives may be, what strategies have been developed, how these might be achieved, by whom and in what order of priority. Without an IAP response activities are likely to be reactive rather than planned and critical issues such as warnings, evacuations and rescues are likely to be addressed by ad hoc means by parties who have not been provided with appropriate direction or information. Accordingly, the timely compilation and issue of an appropriate IAP must be recognised as an essential component of establishing effective control. If effective IAPs cannot be put in place then intervention must occur to remedy this by any means necessary.

#### **Recommendation 57:**

The VFR recommends that:

the state:

- ensure an 'all hazards, all agencies' approach to Incident Action Plan compilation is developed and implemented to enable the timely issue of functional Incident Action Plans. All agency incident action planning processes should be standardised to the fullest extent possible, including consideration of a library of pro-forma Incident Action Plans; and
- develop and implement mechanisms to test and ensure that agencies possess satisfactory incident action planning capability and capacity for 'all hazards' at all levels of operations.

#### **Structure and functioning of EMTs**

EMT structure and functioning generated significant discussions at the VFR multi-agency debriefing sessions. Submissions received by the VFR also provided comment upon EMT operations.

Concerns most commonly expressed related to issues such as identifying appropriate EMT membership, securing consistent representation, lack of IT functionality for information sharing and distribution and general EMT governance matters. It was also suggested that in some instances EMT participants did not have a clear understanding of the function and responsibilities of the EMT and the relationship the EMT should have with the IMT.

Some agencies observed that EMTs tended to be overly focused on tactical and response related issues and did not afford sufficient consideration to longer term and recovery related consequences. It was also felt that in the absence of any standardised approach to EMT functioning, EMT operations would differ markedly across the locations at which they were convened.

The VFR observed that in some locations where EMTs seemed to be more effective than others, this was thought to be more a consequence of a recent history of such EMTs convening in response to emergency events leading to well established relationships, local knowledge and role understanding. Again this points to the importance and value of exercising.

Concerns were expressed at some locations about business practices for EMT operations, with comments reflecting that at some EMT meetings no minutes or notes were being taken, no action items were assigned with this leading to a lack of accountability.

Some agency submissions suggested EMT operations (for all types of hazards) would benefit from the development of a standardised advisory template, which would assure consistency of EMT focus and functioning, including consideration and documentation of the following:

- a broad assessment of the actual and potential impacts of the emergency
- identification and prioritisation of risks and issues
- identification of the required actions
- nomination of agencies accountable for such actions.

It was further suggested that such a document, once produced, could then become a standing agenda item for subsequent EMT meetings where the status of taskings could be reported on by those accountable. The updated template could then be circulated to all participating agencies and to the various tiers of control, command and coordination. This document would also provide local and state governments with a more comprehensive understanding of the event, its impacts, what is being done about it and who is accountable for such actions. In the event of a large scale incident where numerous EMTs may be established, such a document would provide for receipt of EMT information in a common format, enabling ready comparative assessment and ease of aggregation into a common data set.

The VFR notes that the OESC published an EMT Practice Note in May 2009. The preface to this practice note advises its intent is to provide guidance towards a standard approach for EMT establishment and operation. The preface also recognises the need for a consistent statewide approach to the EMT role. Aside from such statements there is little within the practice note that might serve to secure standardised EMT operations across the state. In the absence of any advisory templates, at times when multiple EMTs are established for management of a large scale incident, there is little likelihood of a common focus or approach being applied, or that any end product produced would be in any way similar in format enabling aggregation to a common data set. The VFR considers that an EMT template, as described previously, should be developed, circulated and adopted.

An EMT serves as a critical forum to assist an incident controller in developing strategies to address broader consequence management issues. In these flood events, at many locations, EMT effectiveness was less than optimal for a variety of reasons. Many involved were unfamiliar with EMT operations. Some agency EMT participants were unfamiliar with the affected area as they had been brought in from other areas of the state. In such instances valuable local knowledge and familiarity with local challenges and constraints was said to be lacking. Appropriate business practices for EMT processes were not well ingrained to ensure the necessary focus and accountability. Interoperability issues limited the capacity for EMT members to receive and share information. The absence of any standardised approach to implementation, functioning and outputs for EMTs led to inconsistency in EMT operations. A standardised approach to EMT operations is required to ensure focus on the actual and potential 'macro issues' that will affect community functioning and inform ongoing relief and recovery management.

### Recommendation 58:

The VFR recommends that:

the state:

- revise the Emergency Management Team Practice Note to include a template to ensure an appropriate and consistent approach to Emergency Management Team operations
- provide the revised Emergency Management Team Practice Note to all stakeholders to enable familiarisation; and
- ensure that there is regular exercising of Emergency Management Teams with an 'all hazards' focus.

### Municipal emergency coordination centres

Commentary about MECC operations within this chapter is restricted to matters allied to command and control functions. MECC purpose, functions and operations are more broadly discussed in Chapter Six.

A MECC is a facility that brings together agencies to coordinate the provision of council and community resources during the response and recovery efforts for an emergency. A MECC is staffed and led by the MERC, Municipal Emergency Resource Officer (MERO) and the Municipal Recovery Manager.<sup>178</sup>

The purpose of a MECC is to assist with:

- acquiring, deploying and coordinating resources to support response, community support and recovery activities
- the relief and recovery activities in which council's roles require coordination
- providing accurate logging of information, communications and decisions (as they relate to activities associated with the coordination function) for recording, debriefing and planning purposes
- collating community information and where appropriate disseminating the information in consultation with the control or other relevant agencies.

<sup>178</sup> Office of the Emergency Services Commissioner, Practice Note: *Operation of a Municipal Emergency Coordination Centre*, V 2.1, August 2001



The following tasks may also be undertaken at a MECC:

- registration of volunteer emergency workers
- contribution to the rapid impact assessment process, including maintaining and validating records relating to damage and loss assessment data.

Evidence gathered by the VFR indicates that MECCs operated with varying degrees of success across the response and recovery phases of the floods. MECCs seemed to function more effectively at sites where they could be co-located with the ICC, thus providing the foundation for good communication. However, at many locations where MECCs were established the ICC was a considerable distance away. This was of particular concern to MECC participants who expressed views that incident control was too remote from, and out of touch with, the affected communities. Some MECC participants expressed views that the absence of any visible localised control gave rise to community perceptions that the MECC was actually exercising control for the event as it was the only recognisable focal point for local emergency activity.

The most common concern raised from those engaged in MECC operations related to difficulties in establishing effective communications with the ICC. Examples were cited of ICCs being too busy to take calls, not returning calls, failing to respond to messages left and of ICCs generally being too busy and overstretched to engage. In some instances this may have been attributable to ICC span of control issues, with ICC focus being stretched too far such as in Loddon Mallee with flood impacts extending across many local government areas. Such concerns are illustrated in the following extract from a MAV submission:

*Municipalities also advise there was confusion regarding SES and agency roles, a lack of coordination for important actions such as community meetings and the issuing of warnings as well as informed decisions regarding evacuation. A significant number of councils experienced difficulty in establishing contact with the local SES, while in other cases significant SES operational decisions were not communicated back to the MECC.*

Central Goldfields Shire submitted:

*In the September 2010 and the January 2011 flood events in Central Goldfields Shire, the ICC was set up in Bendigo. Carisbrook, Talbot and Dunolly were almost the first towns to be flooded and the perception was that the ICC in Bendigo was not “in control”. Communications with the ICC from the MECC was almost non-existent. The ICC did not have any useful intelligence and the MECC had to make operational decisions.*

The City of Casey advised:

*A number of staff on the ground assisting at the MECC and at relief centres during the emergency perceived that there was a lack of coordination of the emergency at regional level, and between the ICC and the MECC.*

*This was most evident by the lack of timely, current and verifiable information coming in to the MECC which could then be filtered through to staff at relief centres or to staff providing assistance and support in other parts of the municipality. This compromised the overall effectiveness of the command and control arrangements at the height of the emergency.*

Conversely, ICC staff often expressed views that MECCs were encroaching too far into the operational space. It is probable that a lack of communication and effective engagement between the ICC and the MECC led to bracket creep in the MECC role.

The VFR found that a well ingrained understanding exists across agencies and local government that MECCs are not meant to be decision making centres for operational roles of control or support agencies, nor should MECCs take or duplicate the roles and functions of an ICC. Despite this, it is clear that some MECCs did exercise what could be classed as control functions. The example of Mildura highlights how a MECC became a pseudo control centre in the absence of any other effective control structure being established.

If MECCs are to complement response and recovery activities, they must have effective two-way communication with the ICC. In the absence of this communication roles will become confused and lack coordination, with the activities of each potentially counteracting or duplicating the other. MECCs need contemporary information about the status of the incident, key risks and objectives and how these are being addressed. Similarly MECCs are a valuable source of information that ICCs may utilise to better inform incident control strategies.

Ultimately, the incident controller is responsible for establishing and ensuring effective communications with all groups supporting the emergency response, including the MECC. An incident controller can provide for MECC engagement by various means:

- a MECC Emergency Management Liaison Officer (EMLO) may be appointed to attend at the ICC
- the incident controller can elect to send a control agency EMLO to the MECC
- the incident controller or appointed representative may provide regular briefings to the MECC
- electronic communication means may be utilised (such as emails/teleconferencing/video conferencing etcetera).

OESC has published a practice note for MECC operations within which the process of having a MECC liaison officer in place at the ICC is strongly supported.<sup>179</sup> The practice note also advises of a process that may be utilised to maintain MECC and ICC communications when multiple MECCs may be established. This involves the appointment of a Local Government Liaison Officer (LGLO). A LGLO is a representative from one of the activated MECCs who provides ICC representation on behalf of all activated MECCs. A LGLO appointment is only to occur after thorough consultation and agreement across each of the affected MECCs. In these flood events, at locations where multiple MECCs were established, this LGLO process does not appear to have been utilised.

The communication failures between ICCs and MECCs resulted in many councils not receiving up-to-date information that was essential to flood preparation, evacuation and the transition to recovery. In other cases, some MECCs possessed the most up-to-date information, but were unable to communicate it to the control agency as they were not sure where it was located, or the ICC was so remote (at the regional level) that it was considered to be out of touch with the local situation. In one instance reported to the VFR a control centre relocated and did not advise the MECC until later the following day.

A flow on impact of poor communications between the MECC and ICC is that agencies based at such facilities may not have the most contemporary information about events. The VFR noted that services such as ambulance and VicRoads in some locations were based at the MECC, while in other locations were based at the ICC. The VFR queried what determined where operations would be established and responses generally suggested that this was based on where it was considered the best information would be available.

The MECC practice note advises that MECCs should be exercised annually at a minimum.<sup>180</sup> The VFR learned of many examples of MECCs with no history of exercising in recent years. Undoubtedly, this contributed to a lack of familiarity with MECC roles by those required to perform them.

The VFR also heard of confusion existing concerning processes for requesting resources through MECCs, with comments indicating that arrangements and understandings seemed to differ at various locations and across agencies. Some areas noted that control frameworks would be utilised for requesting certain resources while other areas would make similar requests through coordinator networks. This was said to have caused confusion at state level operations as detailed in the following observation made by a SCC representative:

*... it appears that each agency handles requests and allocation/tracking of resources differently, there is a need to develop a common system and processes. The SCC often deals with duplicate requests and there is an inability to prioritise these. For example between response versus clean-up versus recovery.*

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<sup>179</sup> Ibid p15

<sup>180</sup> Office of the Emergency Services Commissioner – Practice Note – Operation of a Municipal Emergency Coordination Centre Version 2.1 August 2010 (page 18)

The overstretched VICSES regional incident control structure and the absence of an effective level of control at incident level, did not readily support an appropriate level of MECC engagement. In this regard MECC and ICC relationships issues are probably best addressed at the foundation level by first addressing control capacity matters. Notwithstanding this, the VFR considers that much could be done to enhance MECC operations simply by ensuring a better platform for communication is put in place with the ICC. Introduction of a common web based information system should be a priority. Such a system would provide a capacity for both MECCs and ICCs to collect, organise, integrate and distribute information, gain situational awareness and share a common operating picture.

A number of systems already exist in this regard. The 'Noggin' system is used by Ambulance Victoria and the Commonwealth Crisis Coordination Centre, while VicPol use the 'Web EOC' system. As already highlighted, the adoption of multiple systems within Victoria detracts from joined up capability and capacity and strengthens the case for an overarching all hazards emergency management framework to be introduced in Victoria to focus on sector wide and not specific agency capability.

### Recommendation 59:

The VFR recommends that:

the state ensure:

- a common, functional and accessible system be introduced to enable effective Municipal Emergency Coordination Centre and Incident Control Centre communications
- a regime of regular Municipal Emergency Coordination Centre exercising is introduced with oversight by an appropriate independent body. Such exercising should include testing of systems utilised for Incident Control Centre and Municipal Emergency Coordination Centre communications
- those required to perform Emergency Management Liaison Officer roles have undertaken appropriate training; and
- resource requesting arrangements are clarified and documented so that control and coordination functions do not overlap.

## Legislative issues

### Exercising VICSES control functions

The extent and protracted nature of the flood events served to exhaust the capacity of VICSES to perform the controller functions required of them as the control agency for floods. As a means of relieving VICSES controllers who were becoming fatigued, consideration was given to utilising experienced incident controllers from other agencies.

It became evident that the relevant legislation (*Victoria State Emergency Service Act 2005* (VICSES Act) and the EM Act) in place during the flood events did not readily support adoption of an 'all agency' approach when it came to the appointment of incident controllers to provide additional control capacity to VICSES.

While section 31 of the VICSES Act provided the VICSES Director of Operations the ability to delegate powers to an employee of VICSES (not being a volunteer VICSES member), there were no provisions to enable delegation of powers to an employee or member of another emergency service organisation. In application this means that the VICSES Director of Operations could not delegate the power to direct emergency operations (to act in any controller role at any level) to a VICSES volunteer member or to a member of another emergency service organisation.

Similarly, the EM Act did not provide capacity for the appointment of controllers from other agencies for flood events who can then exercise the powers of the control agency.

To overcome these legislative impediments to VICSES utilising controllers from other agencies, a cumbersome process was utilised. A temporary work unit was created within VICSES and the required other agency controllers then became probationary members of VICSES attached to this temporary work unit. Usual VICSES appointment requirements, such as criminal history checks, were set aside and agreements were reached concerning industrial arrangements. VICSES communicated to its workforce advising of the arrangements and directed them to comply with relevant directions issued by other agency controllers.

An effective 'all hazards, all agencies' approach to emergency management has a dependence upon legislative arrangements that readily support interagency operations. VICSES has control agency status for floods, storm events, earthquakes and tsunamis, all of which may have significant impacts and potentially require substantial response efforts and exercise of control only available by way of interagency efforts. The VICSES Act did not adequately support this. Furthermore, the VICSES Act did not seem to adequately support VICSES volunteers exercising control functions under the SERP.

Preliminary legal advice sourced by the VFR suggests that many of the agencies that assisted in the response phase of the floods may have done so in the absence of any express jurisdiction to empower such operational activity.

While minor legislative amendment may remedy these deficiencies, such an approach is not considered to be the most appropriate. The VFR considers that these particular issues should be a component of a complete review of emergency management legislation, which would also include a review of agency specific emergency management legislation. This review must be undertaken with an overarching focus on a capacity for joined up operations and service interoperability to be truly 'all hazards, all agencies' in application.

### Recent developments

The *Emergency Management Legislation Amendment Bill 2011* was passed by Parliament on 25 October 2011. This bill made a number of changes to the *Victoria State Emergency Service Act 2005* (the VICSES Act) to:

- insert a new definition of Chief Officer Operations into the VICSES Act to replace the term "Director of Operations". The Chief Officer, Operations will be appointed under section 29 of the VICSES Act. In renaming the position, there is greater consistency with similar positions in other organisations such as the CFA and MFB.
- remove references to "DISPLAN" and replace with the "state emergency response plan" throughout the VICSES Act
- broaden the powers under the VICSES Act of the Authority and the Director of Operations (re-named Chief Officer, Operations) to enable delegation of their functions, duty and powers. This will avoid difficulties in circumstances where the Authority and the Director has been unable to delegate to Unit Controllers who are volunteers rather than employees and to persons from other emergency services agencies
- broaden further the power of the Director of Operations, to direct emergency operations activities of VICSES members and any persons who voluntarily place their services at the disposal of the Director of Operations, either individually or as members of any government agency or non-government agency. This power may be delegated to other persons such as controllers of registered units or members of another agency appointed to a control of emergency response position (section 32(c)). These powers do not currently exist except to the extent that a direction may be given to members of other agencies or individual VICSES members

who are performing response functions in their capacity as part of a registered unit. This has caused significant operational implications and limits the capacity of VICSES to effectively utilise personnel and resources that might be made available to VICSES by other agencies to assist in emergency responses for which VICSES is the control agency

- allow the Authority to issue standing orders for or with respect to any operational or administrative matters and require all individual VICSES members to comply with any such order that might be made
- allowing for the Authority to have the powers to deal with the registration and deregistration of VICSES units and to register a group of persons as a unit (section 34) rather than the Director of Operations.

These legislative amendments will address the immediate requirement for additional capacity in control responsibilities for VICSES. However the VFR is of the view that similar legislated flexibility is necessary to facilitate and support an 'all hazards, all agencies' approach to emergency management.

### Other legislative issues – emergency interventions

On several occasions during the flood events situations arose that caused particular agencies to consider the legality of actions being contemplated to best manage emergency developments. This extended to agencies seeking legal advice from either their in-house counsel, or from external law firms. Advice sought concerned matters such as powers to enter private property, to remove existing levee banks, to divert waters or direct removal of water diversion installations, to contend with landslips and mechanisms to limit access to, or to compel evacuation from certain areas.

It might be envisaged that understandings relative to such matters would be well ingrained in emergency management arrangements, however this was not always the case. Again the VICSES Act did not readily support actions being taken that might generally be recognised as being routinely necessary to manage a flood event. This led to contemplation of other Acts, such as those in place for fire emergency events, as a means to empower flood emergency interventions. This is most unsatisfactory and again points to outdated and convoluted emergency management legislative arrangements not in need of further amendment, but in dire need of revision.

### Recommendation 60:

The VFR recommends that:

the state undertake a complete review of emergency management legislation. This should include agency-specific emergency management legislation and should focus on service interoperability and securing an 'all hazards, all agencies' capability.

## Addressing operational legal issues

The VFR notes that since the flood events, VicPol has convened an Emergency Response Legal Advisers Forum (ERLAF). Membership of this forum includes in-house counsel, or external law firm representatives, from recognised emergency management stakeholder agencies. The forum was established to ensure that those contemplating emergency management legal issues on behalf of agencies, particularly in a dynamic and time critical environment, would do so based upon a common understanding of the operational context of the advice sought. The forum was also intended to develop relationships across agency legal advisers to enable direct and timely liaison at times when this may be urgently necessary.

The complexities and variables of emergency events will inevitably flush out gaps and shortcomings in legislative provisions for managing such events thereby creating dilemmas for operational practitioners. At such times, well ingrained relationships across agencies should extend to those providing legal advice to such agencies so that legal uncertainties may be resolved in the most timely, informed and appropriate manner. The ERLAF process provides a foundation for this. The VFR endorses the establishment of this forum accordingly.

### Recommendation 61:

The VFR recommends that:

the state formalise and continue the Emergency Response Legal Advisers Forum.

## Water/swift water rescue

Over the course of these flood events there were many instances of rescues being affected of persons who had been trapped or isolated by flood waters. While many of these rescues were not of a high risk as they did not involve deep or flowing waters, other examples were more hazardous, particularly where moving waters were involved. The most serious examples involved significant risk with rescuers bringing to safety persons who had endeavoured to cross rapidly moving waters, but had become trapped part way and were clinging to objects awaiting rescue.

While Part 7 of the EMMV nominates VICSES as the control agency for floods, the nominated control agency for water rescue is VicPol.<sup>181</sup> Key support agencies for water rescue are listed as VICSES and Life Saving Victoria. Part 7 of the EMMV broadly defines all agency roles and within these definitions a number of agencies are listed as support agencies for water rescue. This includes Parks Victoria and the Australian Volunteer Coast Guard Inc. Victoria Squadron. The MFB is also listed as a response agency for rescuing persons from emergencies other than fire and are equipped with boats affording it a water borne capability. Some other agencies such as DSE have boats and a capacity to undertake flood and rescue duties, however DSE is not recognised in the EMMV as having responsibilities for these functions. Additionally, there are a number of volunteer groups that offer a water search and rescue service for their local communities. Two known examples are at Shepparton and Echuca-Moama.

VicPol, as the control agency for water rescue, trains its personnel from the Water Police and Search and Rescue Squad to perform such roles. Squad members undergo extensive in-house training in what is termed as 'swift water rescue'. The VFR note that this term is not defined in the EMMV, yet is recognised in other states. The Queensland Floods Commission of Inquiry heard evidence from the Queensland Fire and Rescue Service, who provided the following definition:

*Swift water is defined as water moving down a gradient and flowing at a speed in excess of two kilometres per hour.*<sup>182</sup>

As highlighted, there were many flood rescues effected over the course of the floods and many agencies were involved. Not all water rescues involved boats. The CFA and the ADF effected many rescues by way of high clearance vehicles. Helicopters were also utilised for rescue purposes.

181 State of Victoria, Emergency Management Manual Victoria, 2011, p 7-73

182 Queensland Floods Commission of Inquiry, *Interim Report*, State of Queensland, August 2011, p168

Water Police and Search and Rescue Squad crews deployed to a number of regional ICCs to avail their water rescue services. The VFR has been advised of some tension at certain ICCs concerning particular agency roles and responsibilities related to water and swift water rescue services.

The CFA advised the VFR that the public expect the CFA to perform rescue at flooding incidents and that this may involve swift water rescue techniques. The CFA detail numerous instances of effecting water rescues over the flood events. Of concern to the CFA is that they are not recognised in the EMMV as either a control or support agency for water rescue. Of further concern to the CFA is that their personnel are potentially endangered when performing water rescues as they are not equipped or trained to do so.

Such concerns have also been identified by various municipalities, who are equally concerned about the safety of those requiring rescue. Buloke Shire submitted:

*The limited resources and equipment of the SES meant that CFA trucks and crews in Charlton became involved in rescue rather than evacuation. CFA members, some of whom are council staff, reported that they felt that CFA trucks were not appropriate for the task either, especially when they were moving through fast flowing and deep water. They felt that they, and sometimes the people being rescued, were being placed in further danger.*

The MFB deployed crews with boats to the flood events to assist with evacuations. In the course of such deployment MFB crews effected boat rescues of persons trapped by flood waters. MFB crews train in water borne operations jointly with members of the Water Police and Search and Rescue Squad.

VICSES advises it has a fleet of almost 100 rescue boats and associated rescue equipment and are able to perform flood rescues as part of an overall flood response where their crews have the appropriate training. VICSES advises it has 299 members trained as coxswains (boat operators) and 487 members trained as crewpersons.

It is noted that the current VICSES State Flood Plan and all VICSES Regional Flood Plans indicate that it is a VICSES responsibility to provide for rescue of persons entrapped by flood waters, while in the same documents VicPol is not listed as having any responsibility in regard to water rescue. This is contrary to what is detailed in Part 7 of the EMMV where VicPol is specified as the control agency for water rescue. It is little wonder that confused understandings exist as to roles and responsibilities when plans, such as those mentioned above, do not accurately depict agency roles recognised in the EMMV.

Flood response activities will inevitably require some degree of water rescue and in reality, many agencies and groups currently perform such roles. A requirement to walk or drive through ankle deep water to effect a rescue may not involve great risk, while a rescue from fast flowing water involves extreme danger and specialist skills. In the absence of any definition and communication about what construes a water rescue, or what defines swift water, interpretations will vary and lead to confused understandings about agency roles and responsibilities.

This lays the foundation for ad hoc arrangements and potential danger to all involved. It is imperative that these matters be clarified so that common understandings exist across all agencies and a level of strategic focus can be applied to the pre-positioning of water rescue capability to areas where this might be envisaged to be required.

When floods impact and there is a need for water rescues, there is no room for a hazard ownership mindset. There must be a willingness to utilise the most readily available resource for a timely and effective response providing they are suitably trained and capable of performing such roles. The VFR doubts that those requiring rescue would be concerned about the branding on the side of the rescuer's boat or vehicle or the badge on the rescuer's shirt.



### Recommendation 62:

The VFR recommends that:

the state ensure:

- water rescue/swift water rescue definitions, roles and responsibilities are clarified and communicated to all stakeholders to ensure common understanding
- appropriate training, equipment and support is provided to those required to perform water rescue/swift water rescue. Common training programs, standards and accreditation should be utilised wherever possible to increase potential for joined up operations and maximised capability
- that based upon the experiences of these flood events, an appropriate level of water rescue capacity and capability is established and maintained
- flood plans (all levels) and flood emergency response planning incorporate consideration of pre-positioning of appropriate water rescue capability in the event that such services should be required; and
- that revised water rescue roles, responsibilities and arrangements are clearly defined in the *Emergency Management Manual Victoria* and such definitions are replicated in all individual agency planning and operational documents.

## Leadership

In the emergency management environment, leadership expectations are outlined in part 3 of the EMMV and apply across all levels of command and control:

- the state controller is to take charge and provide strategic leadership for the resolution of the emergency at the highest level
- a regional controller is to take charge and provide leadership and management across a series of emergency sites within a Victorian government region
- an area of operations controller is to take charge and provide leadership and management across a series of incident sites within a defined area-of-operations, take charge and provide leadership for the resolution of emergencies
- an incident controller is to take charge and provide leadership and management to resolve the emergency at the incident site
- agency commanders are to take charge and provide leadership of agency resources ensuring they are focused on supporting the control agency to resolve the incident.

On many occasions and at a variety of locations during community consultations, the VFR heard that there appeared to be a lack of leadership in the management of the floods and it was often difficult to identify the responsible agency in charge of particular functions. This concern is evident in the following observation made by a community member from the south west region:

*During these floods there was conflicting information concerning the role of the CFA, SES, Glenelg Hopkins CMA, BoM, VicRoads and others as to which organisation was responsible for what.*

The issue of emergency management leadership was also acknowledged as cause for concern in other parts of the state. In its submission to the VFR, Swan Hill Rural City Council advised:

*The verbal feedback provided to council staff in the MECC regarding the Incident Controllers was that community confidence in the leadership was low.*

A public submission from north west Victoria commented:

*It appeared no single person or organisation was taking responsibility for coordinating all the data that was available. No one was in charge or in control.*

Leadership is a pivotal attribute in the exercise of command and control and provides the impetus to bring together internal and external resources to maximise efforts to achieve a common goal. Identifiable leadership provides welcome assurance to affected communities that someone has taken charge and is dealing with the emergency. Such assurance lessens the stress to individuals and strengthens community confidence.

At various levels and locations throughout these flood events strong and effective leadership was lacking. This led to confusion and the filling of the leadership void by entities not having the proper standing for the role in question. Such actions generated further confusion and represented a further departure from the established command, control and coordination arrangements.

### Recommendation 63:

The VFR recommends that:

the state introduce a joint emergency management leadership training program that will deliver critical core competencies for all levels of management of major emergencies. Future appointments to senior operational emergency management positions should require successful accreditation at the appropriate level.

## Training and exercising

At all multi-agency debriefing sessions conducted by the VFR there were calls for the introduction of an effective emergency management training regime to be introduced statewide. Such calls were echoed by MECC and EMT participants who felt that role familiarity was lacking and that future operations would be enhanced should regular training and exercising occur.

The potential value of exercising was readily apparent in locations inundated on multiple occasions. At such locations ICC operations were said to have significantly improved on subsequent occasions simply because those involved became familiar with their roles, formed good working relationships with others in the management structure, understood what was expected of them and became aware of what worked and what didn't work. At Gippsland, which has a recent history of contending with flood events, command and control arrangements seemed far better understood and able to be implemented as compared to locations with no recent flooding history.

The following example is the only recent multi-agency flood exercise that the VFR is aware of:

*In late 2008 the Wimmera Catchment Management Authority (WCMA) commissioned a consultant to compile a flood emergency exercise for WCMA and surrounding councils. This exercise was conducted at Warracknabeal. A police sergeant from Horsham was invited to attend this exercise as an observer.*

*This sergeant subsequently sought and was provided permission to utilise this exercise format for a large scale multi-agency flood emergency event exercise for Horsham and surrounding areas. This exercise was duly conducted at Horsham on 13 November 2009. The exercise focused on testing the functionality of preparedness, response and recovery plans as well as the understanding of arrangements by all stakeholders for major flood events.*

*At the VFR post flood multi-agency debriefing session at Horsham there was resounding agreement from those present that this recent training exercise substantially assisted in providing an effective response to the floods.*

At state level, training and exercising arrangements are the responsibility of the Emergency Management Training and Exercising Strategy Committee (EMTESC).<sup>183</sup> Included in the terms of reference for EMTESC are requirements for it to:

- ensure that training and exercising that is conducted meets community and government expectations
- ensure a whole of government, 'all hazards' approach is adopted for emergency management training and exercising.

Comments from stakeholder agencies about training and exercising arrangements suggest that EMTESC has not been active enough to ensure that sufficient multi-agency training and exercising occurred. Comments also suggested that while in recent times there has been much emphasis on training from a fire response perspective, other hazards such as floods had been neglected.

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<sup>183</sup> State of Victoria, Emergency Management Manual Victoria, 2011, p 5-7

### Recommendation 64:

The VFR recommends that:

the state:

- ensure an appropriate regime of regular emergency management training and exercising is introduced. This must be 'all hazards' and multi-agency focused and include all relevant stakeholders
- designate an accountable officer to hold ongoing responsibility for conducting such exercises; and
- designate the Emergency Services Commissioner as holding ongoing responsibility for auditing and reviewing this training and exercising.

## The alignment of CFA and VICSES

It would be remiss of the VFR to avoid commenting upon the existence of VICSES and CFA in particular, as separate entities, and how some form of closer alignment would better serve Victoria (and rural Victoria in particular) at times of large scale or protracted emergency events.

Both VICSES and the CFA operate under separate board structures. VICSES, as the control agency for floods, storm events, earthquakes and tsunamis, also provides a road crash rescue capability. The CFA is primarily focused on rural fire fighting, while also providing a road crash rescue capability. As already highlighted, VICSES has a regional structure made up of 31 metropolitan and 122 rural units with about 5,500 volunteers and 125 paid staff, while the CFA has more than 60,000 volunteers and about 1,500 paid staff, operating out of 1213 brigades across the state.

By virtue of section 20A of the Country Fire Authority Act, the CFA are to some extent empowered to assist persons and protect property in emergency events other than fires. In reality, each agency assists the other when required and each concedes that different agency systems and processes, the lack of common communications systems and an absence of common training and exercising serve to compromise the effectiveness of their joined-up efforts, particularly in regard to large scale or protracted emergency events. VICSES commit to assisting

the fire services on fire danger days. The CFA in many locations across these flood events arguably provided a greater level of flood response than VICSES actually did. The question that must be asked is whether, under the state's specific hazard and specific response agency arrangements, the Victorian community is extracting maximum emergency management capability and capacity from the resources of these two separate agencies.

Both VICSES and CFA compete for a finite pool of volunteer members from the communities they serve. Successful recruiting by one agency may be to the detriment of the other agency. Aspects of emergency response will entail sustained and physically demanding efforts which can provide challenges in some locations. One submission received by the VFR detailed the make-up of a VICSES unit of 14 members as comprising of four members who were 70 or more years of age, while two others were confined to light duties. Increased volunteerism seems to be the key to enhancing emergency response sustainability. However, attracting additional volunteers, particularly in some locations, can prove quite challenging. The Loddon Shire advised the VFR:

*In small communities there are not enough people to sustain many of the community based volunteer organisations. The CFA struggle to fill 26 local units (brigades) and the VICSES has only one unit to cover the whole shire based at Wedderburn with a very small presence.<sup>184</sup>*

In some townships community members are volunteers in both the CFA and VICSES and will turn out in either of the agency's overalls dependent upon the nature of the emergency that presents. The VFR has learned of one particular town where all but one of the VICSES members also serve on the town's CFA brigade.

The degree of VICSES and CFA overlap both in terms of agency membership and functions performed cannot be ignored, nor can the fact that at present, the joined up efforts of these separate entities do not appear to secure optimal capability or capacity. Strong culture and camaraderie exists in both groups, as does a sense of ownership for hazards for which they are the recognised control agency. However, culture, agency history and hazard ownership are not matters of broad interest to the Victorian community who are more concerned with securing the most timely and capable emergency response available to fulfil community needs.

<sup>184</sup> Loddon Shire Council submission to VFR, 5 May 2011

The VFR received a submission from the Community and Public Sector Union (CPSU) said to be made on behalf of VICSES full time staff. This submission, while acknowledging that no emergency service can be expected to be resourced on an ongoing basis for peak operational periods, suggested that as a minimum, only VICSES staff should perform the Regional/Area controller roles, the Incident and Deputy Incident Controller roles and the Operations, Information and Safety Officer roles. The CPSU recommended that VICSES be resourced accordingly to enable this.

The VFR is unable to support this proposal given the reality that peak demand may challenge capacity. Such times call for a capability to draw on capacity existing within other agencies and not an unwillingness to let go of certain roles considered to be agency exclusive. Large scale emergency events demand teamwork and collaboration enabling joined up agency operations to provide the best possible response service to the community. There is no place for cultural or attitudinal barriers that may impede placement of the most qualified person in any particular role.

Any move towards more unified VICSES and CFA operations may well be challenging and subject to opposition at a variety of levels. However, logic demands a rethink of the continued existence of these two groups as hazard specific separate entities, each working under their own board structure, with separate systems and processes consistent with each focusing solely on individual agency responsibilities. Such arrangements do not provide for maximisation of capability and capacity when this may be urgently required.

#### **Recommendation 65:**

The VFR recommends that:

the state develop and implement a strategy that maximises the flexibility and united capacity of the Country Fire Authority and the Victoria State Emergency Service to respond to emergencies.

## **Addressing the ‘all hazards, all agencies’ myth**

Although it is often stated that Victoria has a modern and adaptive emergency services sector with an ‘all hazards, all agencies’ approach to emergency management, a review of these flood events does not provide evidence to support such statements. The first question that arises is what body/structure/controls or frameworks exist to ensure agencies in the sector are focused on such an approach and how is this tested or measured?

As already highlighted, Victoria has no standards with which to hold control agencies to account, or for such agencies to aspire to. Neither does Victoria have any overarching structure/body/group or strategy to ensure that individual agencies afford consideration to hazards other than those within their particular silos of responsibility. Agencies have been able to develop separate and incompatible IT systems, seemingly not considering cross agency functionality issues. The state has recently invested heavily to establish or upgrade a network of some 43 ICCs to enhance bushfire response capability statewide. Information technology and communication system fit ups within these centres cater for CFA and DSE for fire fighting operations. Such fit ups, however, do not cater for VICSES operations. This points more to a hazard specific investment and not one intended to promote integration, interoperability, or multi-agency, ‘all hazard’ capability.

Aside from ICC functionality, there are numerous other long understood barriers and impediments existing which serve to inhibit the effectiveness of joined up agency operations. Legislative issues complicate agencies working together and give rise to personal liability concerns for emergency controllers and responders. There are fundamental failings with communications systems that have been reported on for many years. Agencies have different procurement processes and even operational terminology is not standardised leading to confused understandings at incident level when agencies are jointly contending with emergencies. An absence of structured and regular multi-agency training and exercising means that personnel are unaware of other agency systems, processes and methods of operation. Ad hoc methods are devised in an endeavour to provide different agency representatives with a common operating picture. On many occasions, the VFR heard that the biggest distraction in the early stages of emergency response was caused by having to devise any means possible to overcome system and process issues because different agency applications simply would not work together.

The VFR contends that these interoperability issues are largely a consequence of there not being any emergency management sector wide overarching governance framework in Victoria. Separate boards of management exist for stakeholder agencies such as the CFA, VICSES, Ambulance Victoria and MFB. Such boards understandably are focused on legislated individual agency requirements that do not provide for effective sector wide and 'all hazards' focus and decision making.

The following questions must be asked:

- what does Victoria need to better manage large scale or protracted flood emergencies, or other significant emergency events of any nature?
- how can the state's risks be better recognised and planned for?
- can the state's hazard – specific agency approach to emergency management be reshaped to ingrain an 'all hazards, all agencies' philosophy and capability?
- what is required to drive a multi agency surge capacity to support agencies working together when necessary?

The VFR considers that such issues will not be resolved until the state addresses a void that exists in the emergency management arrangements. This void is the absence of any overarching strategy or enabling policy framework to drive reform of the present siloed approach, whereby particular agencies focus on specific hazards with a lack of peripheral vision to consider whole of sector emergency management capability enhancement. This situation is illustrated in figure 19 on the following page.

## Previous attempts at emergency management sector reform

In May 2006, DOJ released an Emergency Management Discussion Paper intended to explore opportunities and new directions for the state's emergency management arrangements. This paper focused on various core principles including enhancing public safety, consideration of a wide range of hazards and integration of all relevant emergency management agencies. Broad consultation followed with copies of the paper distributed to more than 300 organisations and individuals involved in the Victorian emergency management sector. A second round of consultation concluded in late 2007. This discussion paper process, while not securing any substantive change, appears to have led to the development of an Integrated Emergency Services Framework (IESF) project.

In mid 2007 an IESF project was commenced by the OESC. A project board was established which included heads of all stakeholder agencies. The aim of the IESF project was to provide clear strategic intent and guide action and investment for the emergency services sector over the next five to ten years. The IESF noted that it is simply not enough for emergency services to do more of the same in the face of escalating demands, as they will not be able to keep pace. The IESF focused on five strategic directions, which are summarised as follows:

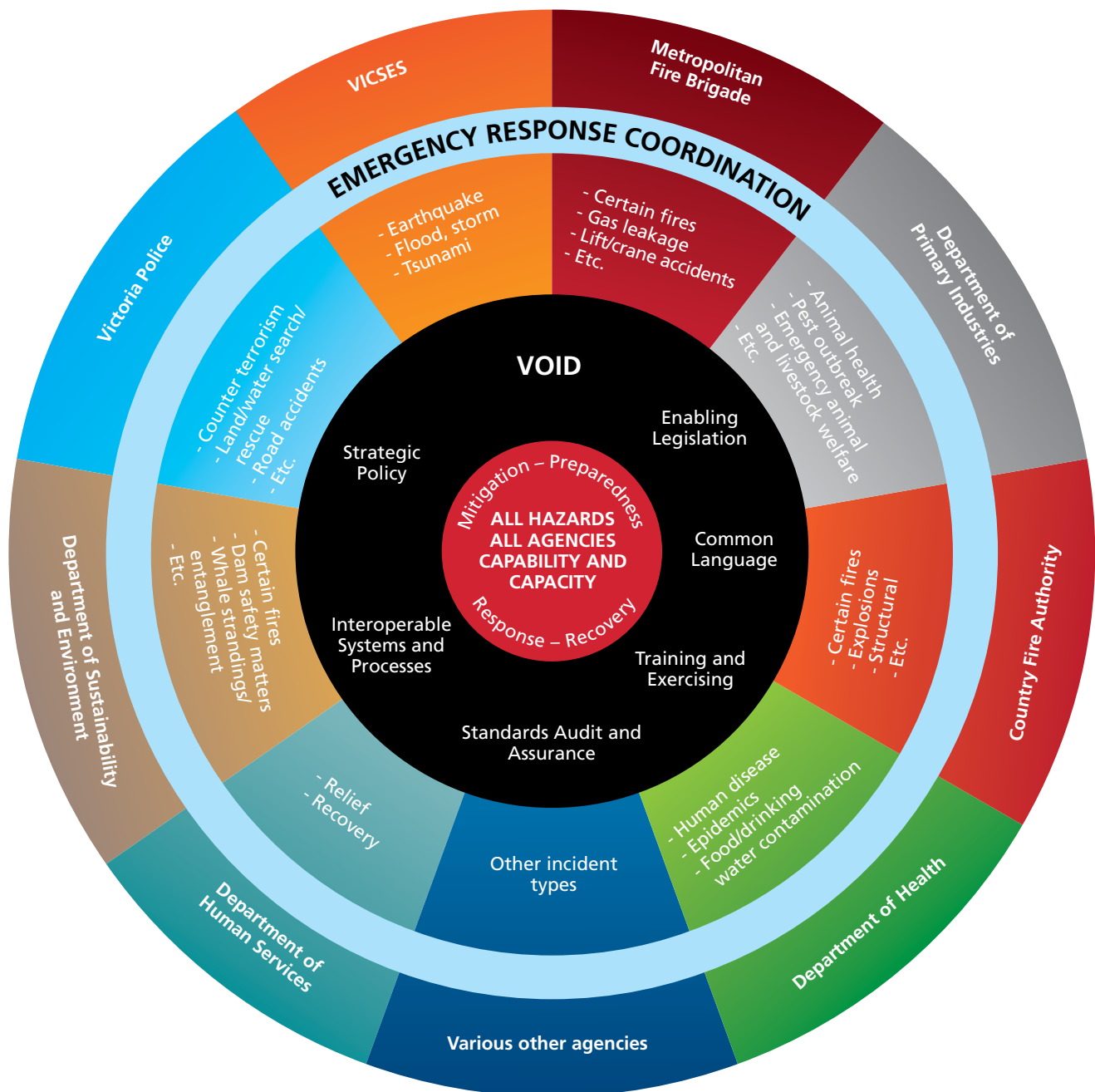
1. **Safe and resilient communities** – Recognising the need to work more with, rather than for, the community and ensure effective engagement on an 'all hazards' basis, including community involvement in planning functions and enhancing community access to information
2. **Modern and Adaptive Emergency Services** – A departure from traditional practices to embrace new models of service delivery (recognition of the shortfalls of the current siloed, hazard specific emergency management)
3. **Emergency Services Working Together** – Clarification of the many existing ad hoc arrangements and addressing ineffective partnerships agency cultural differences/ training differences/system differences
4. **Capable and Sustainable Workforce** – Better recognition and utilisation of volunteer capacity – development of an 'all hazards' and not a hazard specific focus – build on capacity to sustain long term response
5. **Responsive and Enabling Systems to Support Service Delivery** – Addressing communication and system incompatibility/interoperability failings and providing an appropriate legislative model to support emergency management demands and practice.

In November 2008 the IESF document was provided to the then Minister for Police and Emergency Services for approval and sign off. However, sign off was not obtained.

On 7 February 2009, the Black Saturday bushfires occurred. The following month the VBRC commenced and in August 2009, the VBRC released its *Interim Report*. The VBRC *Interim Report* recommendations led to some revision of the IESF document.

In November 2009, the Minister for Police and Emergency Services endorsed the IESF with a proviso that at that juncture it was only to be provided to heads of agencies and that its content was to be reconsidered upon the VBRC releasing its *Final Report* (which was due on 31 July 2010). The IESF was put on hold pending the release of the VBRC *Final Report*. The IESF does not seem to have progressed beyond this point.

Figure 19 The emergency management framework void





The VFR believes the IESF to be a fundamentally sound document which could be further enhanced if updated to reflect issues identified in this review. The VFR also considers that adopting and actioning an updated IESF would do much to address many of the failings now evident in Victoria's emergency management arrangements.

As indicated previously, the VBRC heard evidence about an ineffective VEMC. Within this evidence, the VBRC was also alerted to the government calling for advice on creation of an 'Emergency Victoria' concept which was intended to provide a unifying momentum to better provide for agencies uniting in response to large scale multi-agency events. While the VBRC made various recommendations about bushfire-related emergency response arrangements, it did not make any recommendation about either VEMC structures or operations, or the need for a body such as 'Emergency Victoria'.

On 5 April 2011, the VFR conducted a state level debriefing exercise involving senior government and non-government emergency sector representatives and stakeholders. This forum served to validate the many concerns that the VFR had already heard through the community consultation and regional level debriefing processes. Attendees at the state level debriefing submitted that Victoria, as an alternative to current arrangements and to address the many shortcomings existing, urgently needed to establish a new overarching emergency management body with a focus on emergency prevention, planning, response and recovery. This proposal received overwhelming endorsement from the broad range of attendees.

The VFR notes that some of these issues have been addressed in the government's green paper, *Towards a more disaster resilient and safer Victoria*, released on 12 September 2011.

On the basis of considerable evidence available to the VFR, it is concluded that emergency management agencies and other stakeholder groups are in broad agreement that significant sector reform is required. A variety of government discussion and other papers also advocate the need for reform. Evidence provided to the VBRC by the state suggests sector reform is warranted. Clearly there is a pressing need for this reform to take place as soon as possible.

#### Recommendation 66:

The VFR recommends that:

- the state undertake major reform of Victoria's emergency management arrangements to bring about an effective 'all hazards, all agencies' approach, incorporating:
- clarity of command and control in all emergencies
- common operating platforms, including communications and information technology
- interoperability between all agencies
- regular joint training and exercising by all agencies
- the development and implementation of performance standards for each emergency management agency
- the development and maintenance of effective planning arrangements at all levels of emergency management
- a meaningful monitoring and audit regime for designated standards and planning requirements; and
- an effective accountability mechanism to support the maintenance of legislative and other agency obligations.

This major reform program will require amendment to legislation, policy, structures and procedures.