

Parliamentary Inquiry into the 2022 Victorian Flood Event

May 2023

Submission on behalf of the Victorian Government

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Terms of reference

Matter	Chapter
Preparedness for and response to the Flood Event	Chapter 2
(1) The causes of and contributors to the Flood Event	Chapter 3
(2) The adequacy and effectiveness of early warning systems	Chapter 4
(3) The response and resourcing of VICSES	Chapter 5
(4) The implementation and effectiveness of the 2016 Victorian Floodplain Management Strategy in relation to the Flood Event	Chapter 6
(5) The location, funding, maintenance and effectiveness of engineered structures such as flood walls, rural levees and culverts	Chapter 7
(6) The Flood Event as a whole, including specific affected catchments and floodplains	Chapter 8
(7) The Flemington Racecourse flood wall and related matters	Chapter 9
(8) The implications of the 2022 Flood Event for future planning decisions, including the use of the Victorian planning framework to mitigate climate change	Chapter 10
(9) Any other related matters	Chapter 11

1. Introduction

Key points

This chapter introduces the Victorian Government's submission to the *Parliamentary Inquiry into the 2022 Victorian Flood Event* and gives a brief description what each chapter includes.

The Victorian Government welcomes the Legislative Council Environment and Planning Committee's Inquiry into the State's preparedness for, and response to, the major flooding event of October 2022 (the Flood Event). Individuals and communities across Victoria were impacted and the Inquiry will help us learn from what happened.

This submission by the Victorian Government does not attempt to provide a comprehensive account of the Flood Event. It aims to assist the Committee by:

- responding to the terms of reference of the inquiry
- providing factual information and context on key activities
- highlighting key matters for consideration.

Chapter 2 **Preparedness for and response to the Flood Event** provides an overview of Victoria's emergency management arrangements, including the legislative and policy framework. It explains how Victoria's governance arrangements support and ensure effective cooperation and coordination across agencies when delivering emergency management functions.

It outlines the increasing frequency, severity and complexity of emergency events – driven by climate change – that will continue to challenge the emergency management sector and the resilience of communities, businesses and the environment.

This chapter also outlines how Victoria's emergency management arrangements have been strengthened and refined in response to lessons learned from significant natural disasters and other emergency events. This has included independent reviews and inquiries and continuous improvement processes.

Chapter 3 **Causes of and contributors to the Flood Event** outlines the effects of La Niña weather patterns over the past three years and notes there is evidence to suggest there will be more intense rainfall and flooding events over time.

Chapter 4 **Early warning systems** sets out the Victorian Warning System, including the framework for identifying flood risks and providing information and warnings to the community. It outlines how these arrangements applied in relation to the Flood Event and the role of key agencies.

Chapter 5 **Victoria State Emergency Service** describes the responsibilities of the Victoria State Emergency Service (VICSES) as the control agency for flood, and how other agencies offer support, as part of Victoria's integrated emergency management arrangements. It outlines how they worked together to provide resources during the Flood Event response.

The chapter also details the funding arrangements for VICSES – government grants and State Budget initiatives.

Chapter 6 **The Victorian Floodplain Management Strategy** provides an overview of the Victorian Floodplain Management Strategy. It reviews the implementation and effectiveness of the Strategy in clarifying the roles and responsibilities of government agencies and authorities involved in flood management mitigation.

Chapter 7 **Engineered flood mitigation structures** examines the cost sharing arrangements for designing and constructing flood mitigation infrastructure.

It explains that most levees were built without design standards and their structural integrity cannot be relied upon. Flood mitigation infrastructure outside Melbourne Water's region not currently under formal management will remain that way unless relevant local government authorities (LGAs) decides this should change.

Part 7A of the *Emergency Management Act 2013* and the Victorian Critical Infrastructure Resilience Strategy outline measures that owners and operators of critical infrastructure covered by the Act should take to manage emergency risks that will affect service delivery.

Chapter 8 **Flood Event as a whole and affected catchments and floodplains** provides a factual overview of the Flood Event with data and spatial information. It includes the catchments and floodplains of the Avoca, Barwon, Broken, Campaspe, Goulburn, Loddon, Maribyrnong and Murray rivers. There are detailed narratives for significantly impacted areas.

Chapter 9 **Flemington Racecourse flood wall** provides an overview of the decision by the Minister for Planning to approve the construction of a flood wall around Flemington Racecourse.

Chapter 10 **Implications for future planning decisions** describes Victoria's land use planning system under the *Planning and Environment Act 1987* and building system under the *Building Act 1993* and Building Regulations 2018. It outlines the function of the Victoria Planning Provisions and the role of planning schemes as statutory instruments that set out objectives, policies and provisions relating to the use and development of land. The chapter reflects on the role of strategic planning in mitigating flood risk, including in the context of climate change, and the role of the building system.

Chapter 11 **Other related matters** addresses areas not specifically covered in the terms of reference. They include:

- Accelerating climate change, shifting population and settlement patterns, and compounding disasters mean that Victoria's emergency management systems will need to continue to evolve to build resilience to future challenges.
- The cost of disasters is expected to rise significantly in coming decades.
- Despite the importance of insurance in mitigating the financial risks of emergency events, many people and businesses are uninsured or under-insured.

2. Preparedness for and response to the Flood Event

Key points

The increasing frequency, severity and complexity of emergency events – driven by climate change – will continue to challenge the emergency management sector and the resilience of communities, businesses and the environment.

Victoria's emergency management arrangements have been strengthened and refined in response to lessons learned from significant natural disasters and other emergency events. This has included continuous improvement processes, independent reviews and inquiries.

Victoria's robust governance arrangements support and ensure effective cooperation and coordination across agencies when delivering emergency management functions.

All levels of government and the community work together to achieve a shared vision of *safer and more resilient communities*.

2.1 Emergency management in Victoria

Victorians have faced a range of emergencies in recent years, including devastating bushfires, storms, floods, an earthquake and the COVID-19 pandemic. All have tested communities and the emergency management sector, and there will be more challenges in the future.

Climate change is increasing the severity, frequency and duration of natural disasters in Victoria on individuals, communities and the environment as well as the emergency management sector, critical infrastructure, government and essential services.

The future will bring more serious, more regular, concurrent and compounding emergency events that are increasingly beyond the scale of our past experiences. It is critical that we learn from these and look for ways to improve how we collectively prevent, prepare for, respond to and recover from future emergencies.

Our experiences of, and the reviews and inquiries that follow disasters and other emergencies, have continued to inform the development and implementation of Victoria's emergency management arrangements. Continuous improvement and reform over a long period have provided a solid foundation from which to prepare for and respond to emergency events and to build *safer and more resilient communities*.

Victoria's effective, integrated and coordinated response to the Flood Event reflects the success of the past decade's sector-wide reforms and the ongoing commitment and courage of volunteers and career emergency services personnel. Emergency management reforms have built the sector's ability to partner with communities before, during and after events to reduce the likelihood and consequences of emergencies. Partnerships mean we can better mitigate hazards and build community resilience.

The foundations of Victoria's current comprehensive emergency management arrangements were initially established following a review of the 1983 Ash Wednesday bushfires. At the time of enactment, the *Emergency Management Act 1986*¹ (EM Act 1986) gave greater responsibility to individual municipalities, fire and emergency services.

¹ <https://www.legislation.vic.gov.au/in-force/acts/emergency-management-act-1986/051>

The *2009 Victorian Bushfires Royal Commission*² and the *Review of the 2010–11 Flood Warnings and Response*³ led by Mr Neil Comrie AO APM also highlighted the opportunity to improve Victoria’s emergency management arrangements. They recommended:

- greater clarity in command and control structures and interoperability across agencies
- strengthening of communication tools and warnings
- building community resilience and shared responsibility in emergency management.

In response, the *Victorian Emergency Management Reform White Paper*,⁴ released in December 2012, set an ambitious ten-year roadmap for reform built on the following principles:

- emergency management based on community participation, resilience and shared responsibility
- efficient governance arrangements that clarify roles and responsibilities, embed cooperation across agencies, and ensure emergency management reform is coordinated across the sector
- an ‘all hazards, all agencies’ approach with networked arrangements, greater interoperability and a stronger emphasis on risk mitigation.

The ‘all hazards, all agencies’ approach to emergency management recognises no single agency can address all the impacts of a particular emergency. Instead, effective mitigation, response and recovery require multiple agencies to work together as one. This philosophy has led to a more prepared and informed community and a stronger, more capable emergency management sector.

Significantly, the reforms explicitly acknowledge and establish the role of communities in emergency management – ‘all emergencies, all communities’. As outlined in the *Community Based Emergency Management Overview*,⁵ although some organisations have specialist roles, emergency management is not something done by one single organisation or sector to, or for, the rest of the community. It is a shared responsibility across:

- all levels of government
- non-government organisations
- Victoria’s First Peoples
- community groups
- networks
- businesses
- individuals
- households
- visitors to Victoria
- the emergency management sector.

Victoria’s emergency management reforms established integrated arrangements with clear roles and responsibilities, well-defined lines of control and robust governance arrangements. They facilitate the involvement of all levels of government, non-government organisations, volunteers and the private sector.

Community-led activities can generate ownership of decisions and result in more sustainable, higher quality outcomes and innovative solutions. Our emergency management framework is specifically designed to encourage local involvement at all levels. The needs of people potentially impacted by disasters will be best addressed if they are involved in preparedness, planning, response, relief and recovery.

² <http://royalcommission.vic.gov.au/Commission-Reports/Final-Report.html>

³ [Review of the 2010–11 Flood Warnings and Response – Final Report, Victorian Government \(archive.vic.gov.au\).](#)

⁴ [Victorian Emergency Management Reform White Paper Dec 2012, Emergency Management Victoria \(emv.vic.gov.au\).](#)

⁵ [Community Based Emergency Management Overview 2023, Emergency Management Victoria \(emv.vic.gov.au\).](#)

2.2 Victoria's emergency management legislative arrangements

A key element of the White Paper reform was the *Emergency Management Act 2013* (EM Act 2013).⁶ It provides a statutory basis for today's emergency management arrangements, including the establishment of entities such as:

- Emergency Management Victoria (EMV)
- the Chief Executive of EMV
- the Emergency Management Commissioner (EMC)
- the primary control centre for Victoria, known as the State Control Centre (SCC)
- the Inspector-General for Emergency Management (IGEM)
- the State Crisis and Resilience Council (SCRC).

The EM Act 2013, also provided clarity and certainty regarding how agencies must work together, and with business and the community across the three phases of emergency management:

- mitigation (including planning and preparedness)
- response (including immediate relief)
- recovery.

The *State Emergency Management Plan* (SEMP)⁷ explains the integrated, coordinated and comprehensive state level operational arrangements. These are determined by how an emergency is classified.

See section 2.4 for more detail on Victoria's operational emergency management arrangements.

Emergency Management Victoria

The EM Act 2013 establishes EMV as a statutory entity jointly led by the EMC and a chief executive. It is Victoria's overarching emergency management body and plays a key role in implementing the Victorian Government's emergency management reform agenda. EMV must collaborate and consult with a range of agencies, organisations and departments who share responsibility for ensuring a sustainable, effective and community focused approach to emergency management. Its functions include:

- coordinating the development of whole-of-government policy for emergency management
- advising the Minister for Emergency Services on emergency management policy
- implementing emergency management reforms assigned by the Minister
- liaising with the Australian Government on emergency management
- supporting the EMC to perform their functions.

EMV must have regard to the fundamental importance of the role volunteers play, and to decisions made by the SCRC.

⁶ <https://www.legislation.vic.gov.au/in-force/acts/emergency-management-act-2013/020>

⁷ <https://www.emv.vic.gov.au/responsibilities/semv>

Chief Executive of EMV

The Chief Executive is responsible for the general management and conduct of EMV's activities and the effective, efficient performance and exercise of its functions and powers. The Chief Executive provides advice to the Minister and takes a lead role in coordinating investment planning and large-scale strategic projects on behalf of responder agencies. This includes major procurement, communications and information systems, emergency management planning processes and more.

Emergency Management Commissioner

The EMC is an independent statutory office appointed by the Governor in Council. It has significant statutory responsibilities under the EM Act 1986 and EM Act 2013 in relation to the management of major emergencies. Its key functions, outlined in section 32 of the EM Act 2013, include:

- managing the State Control Centre (SCC) on behalf of, and in collaboration with, all agencies that may use the primary control centre for emergencies
- ensuring the Minister for Emergency Services is provided with timely and up to date information on actual or imminent major emergencies and the response to major emergencies, and providing advice to the Minister on other matters relating to the EMC's functions
- leading and promoting the implementation of the *Victorian Emergency Strategic Action Plan (SAP)*⁸ to the extent that it relates to the improvement of the operational capability of responder agencies
- overseeing the continuation of operational reforms provided for in the fire services action plan
- providing advice to the Minister
- developing and maintaining incident management operating procedures and operational standards for the performance of emergency management functions by responder agencies
- coordinating data collection and impact assessment processes.

The EMC also has specific functions in relation to emergency management planning, including responsibility for the preparation and review of the SEMP⁸ and approval of regional emergency management plans (REMPs).

State Control Centre

As noted above, the EMC manages Victoria's primary control centre, the SCC. The SCC has a dedicated workforce and provides a 24/7, 365 days-a-year service, working with all agencies in preparing for, responding to and assisting recovery from emergency events that affect the Victorian community.

Its integrated workforce has a base team of EMV personnel that come together with agency personnel to collectively meet the centre's objectives.

Inspector-General for Emergency Management

IGEM is an independent statutory officer appointed by the Governor in Council. Its primary role is to provide assurance to the government and community regarding Victoria's emergency management arrangements and foster continuous improvement. It undertakes objective and system-wide

⁸ <https://files.emv.vic.gov.au/2023-03/EM%20SAP%202022-25%20updated%2029%20March.pdf>

⁸ <https://www.emv.vic.gov.au/responsibilities/semp>

reviews, evaluations and assessments of Victoria's emergency management arrangements and sector-wide performance, to:

- identify emerging issues for the emergency management sector
- provide reliable, evidence-based information on what works well and suggest improvements
- identify ways for Victoria's emergency management sector to learn and get better
- provide the government and community with confidence that emergency management arrangements are fit for purpose.

State Crisis and Resilience Council

The SCRC is Victoria's peak crisis and emergency management advisory body. When consulted, SCRC advises the Minister for Emergency Services and other relevant ministers on emerging or complex emergency and crisis management issues.

Secretaries of all Victorian Government departments, the Chief Commissioner of Police, the EMC, the Chief Executive of EMV and the CEO of the Municipal Association of Victoria are part of the SCRC. The Inspector-General for Emergency Management (IGEM) and Chief Executive Officer of Emergency Recovery Victoria (ERV) are observers.

Under the EM Act 2013, the SCRC is responsible for developing three-year rolling emergency management Strategic Action Plan (SAP). The SAP is updated annually and approved by the Minister for Emergency Services.

The SAP steers the government's vision to support Victoria in achieving safer, more resilient communities and outline the state-wide strategic priorities, investment and principles of government and the emergency management sector. It sets out specific actions for government departments and responder agencies, which they must implement.

In the event of a complex or large-scale disaster, the SCRC's role is to:

- ensure that broad social, economic, built and natural environment consequences are addressed at a whole-of-Victorian-Government level
- identify and access government resources as required
- oversee communications strategies.

2.3 Emergency management strategic priorities

Victoria's Sector Outcomes Framework, Strategic Roadmap and Strategic Action Plan 2022–25

In 2023, the Victorian Government released Victoria's *Sector Outcomes Framework* (Framework), *Strategic Roadmap* (the Roadmap) and the SAP for 2022–25.⁹ Collectively, they set out a clear direction for the emergency management sector, guiding future reform work and investment decisions.

The Framework covers the sector's shared vision for *safer and more resilient communities*, as well as outcomes that describe what success will look like. The Roadmap then describes how the emergency management sector will deliver the outcomes over the next six years, while the SAP provides a detailed three year work plan (see SCRC above).

⁹ [Strategic priorities | Emergency Management Victoria \(emv.vic.gov.au\)](https://www.emv.vic.gov.au/strategic-priorities)

Community resilience

Community resilience is at the heart of Victoria's emergency management arrangements. *The Community Resilience Framework for Emergency Management*¹⁰ (the Resilience Framework), released in 2017, aims to bring the community to the centre of emergency management strategies, programs and approaches. Based on the idea that communities and individuals recover more quickly and are better placed to respond to and recover from subsequent emergencies, it encourages emergency sector agencies to consider how their actions contribute to community resilience.

All departments and agencies in this sector have their own strategies for working with communities to build resilience. One example is the Victoria State Emergency Service (VICSES) *Community Resilience Strategy 2016–19*,¹¹ which marked a significant change in service delivery for VICSES, promoting a shift from the traditional response-based approach to an outcomes-based model that empowers communities to develop awareness, shared responsibility and self-reliance – before, during and after emergencies.

The Strategy Renewal 2019–22 extended the approach for three more years, building on key achievements and lessons already learnt. VICSES' strategy continues to provide a road map for the design and development of community resilience activities and for delivery and evaluation of programs and resources.

2.4 Managing all phases of emergencies

Victoria's emergency management arrangements support activities across the three phases of an emergency: mitigation, response and recovery. These are outlined below.

2.4.1 Mitigation (including planning and preparedness)

Mitigation involves the delivery of actions across government, business and the community to eliminate or reduce the incidence or severity of emergencies and minimise their effects. It is a critical component of emergency management given the growing social, economic and environmental costs of major emergencies and the increasing impacts of climate change.

The broader legislative roles and responsibilities of government departments and agencies are reflected in the SEMP. Additional detail is provided in hazard-specific SEMP sub-plans.

Agencies and departments contribute to the mitigation of emergencies as part of their business-as-usual functions by:

- formulating and implementing policies, programs and regulations (such as land-use planning, building regulations, floodplain management and climate change policies)
- building, operating and maintaining infrastructure
- promoting individual and household financial resilience to the consequences of emergencies (for example, through home and contents insurance)
- exercising emergency management arrangements
- engaging the community in building resilience, raising awareness of risk and promoting protective actions.

¹⁰ [Community Resilience Framework for Emergency Management \(2017\). Emergency Management Victoria \(emv.vic.gov.au\)](#)

¹¹ [Community resilience \(ses.vic.gov.au\)](#)

Chapters 6 and 7 provide a more detailed overview of mitigation activities in relation to flood plain management and the use of engineered structures such as flood walls, levees and culverts.

Chapters 9 and 10 consider flood mitigation activities in regard to land use and spatial planning.

Emergency management planning

The framework for emergency management established in the EM Act 2013 requires state, regional and municipal plans for the mitigation of, response to, and recovery from emergencies.

At state level, the SEMP prepared by the EMC sets out a coordinated and comprehensive approach to emergency management, including:

- information on Victoria's command, control and coordination arrangements
- state emergency management priorities to underpin and guide all decisions made during emergencies in Victoria
- agency role and responsibilities for the mitigation, response and recovery phases of emergency management.

SEMP sub-plans¹² are developed to provide specific information on managing particular emergencies. The Flood Sub-Plan¹³ outlines integrated arrangements for managing the three phases of a flood emergency. This sub-plan and the state's Storm Sub-Plan were both reviewed, endorsed and published in February 2022.

EMV is also responsible for coordinating the state-wide emergency risk assessment published in the *Emergency Risks in Victoria*¹⁴ report. The risk management approach aligns with the SEMP and outcomes and objectives of the *Sendai Framework for Disaster Risk Reduction 2015–30*¹⁵ and the *National Disaster Risk Reduction Framework*.¹⁶

Eight designated regions¹⁷ have a Regional Emergency Management Planning Committee (REMPC). Each produces a regional emergency management plan (REMP), approved by the EMC. All Victorian municipalities¹⁸ have a municipal emergency management plan (MEMP) approved by their REMPC in accordance with the Emergency Management Planning Guidelines. REMPs and MEMPs ensure that planning reflects area-specific risks.

Each region has a current flood sub-plan.¹⁹

Preparedness

The SEMP sets out what agencies in the emergency management sector must do to prepare for and reduce the effects of emergencies. This includes having plans and capability and capacity for response and recovery. The *Victorian Preparedness Framework*²⁰ informs and guides their planning. It sets out five core capability elements:

¹² [State Emergency Management Plan \(SEMP\) Sub-Plans \(2022\). Emergency Management Victoria \(emv.vic.gov.au\).](#)

¹³ [SEMP Flood Sub-Plan 3.0 \(2022\). Emergency Management Victoria \(emv.vic.gov.au\).](#)

¹⁴ [Emergency Risks in Victoria \(2014\). Department of Justice and Community Safety Victoria.](#)

¹⁵ [What is the Sendai Framework for Disaster Risk Reduction? United Nations Office for Disaster Reduction \(UNDRR\)](#)

¹⁶ [National Disaster Risk Reduction Framework \(2018\). \(homeaffairs.gov.au\).](#)

¹⁷ Victoria, *Government Gazette*, No G39, 1 October 2020, 2064-2067.

¹⁸ Within the meaning of s 3(1) of the *Local Government Act 2020*.

¹⁹ [State and regional emergency plans \(ses.vic.gov.au\).](#)

²⁰ [Victorian Preparedness Framework May 2018. Victorian Government \(www.vic.gov.au\).](#)

- | | | |
|--------------|---------------|--------------|
| 1. people | 3. governance | 5. processes |
| 2. resources | 4. systems | |

Twenty-one core capabilities underpin all phases of emergency management, helping the sector estimate their capability requirements and set capability targets, based on critical tasks.

Agencies must report annually to the EMC and the Minister for Emergency Services on how they are carrying out their roles and responsibilities under the SEMP. This includes providing annual seasonal assurance reporting on their preparedness.

Other preparedness initiatives include:

- Key committees, departments and agencies with emergency management responsibilities carry out regular exercises, to test the decision-making capability and capacity of their committees, in a safe learning environment.
- Extensive work is done with industry and community to consider Victoria's critical infrastructure resilience arrangements, including legislation, strategy, regulations and Ministerial guidelines. Industry sectors come together to consider different emergency scenarios; providing a framework for collaboration, information sharing, and building sector or organisational resilience across all hazards – water, food and grocery supply, health, energy, transport, communications, banking and finance and government.
- Common doctrine provides a platform for working together through a unified understanding of roles and responsibilities, an integrated knowledge base for making decisions, and consistent standards against which performance can be measured. The common doctrine includes joint standard operating procedures (JSOPs).
- Regular activities happen year-round to support individual community preparedness and resilience. In the lead up to high-risk periods, broad-based and targeted community awareness campaigns operate.

2.4.2 Response (including relief)

The response phase of emergency management involves activities undertaken immediately before, during and in the immediate aftermath of an emergency:

- to reduce the emergency's effects and consequences on people (their livelihoods, wellbeing and property)
- to meet basic human needs.

The response phase, therefore, includes the delivery of relief activities.

The EM Act 2013 and the SEMP establish command, control, coordination and consequence management arrangements for the response phase of an emergency. They ensure that resources are deployed in a coordinated way and that consequences are managed. Agency responsibilities for response and relief are set out in the SEMP.

Flood emergency responses can include:

- emergency access routes for evacuation from flooded areas (preventing loss of life)
- relief programs (including establishing relief centres)
- flood warning and forecasting systems, including trigger points
- temporary flood mitigation infrastructure for example sandbags, temporary levees
- community engagement, education and awareness

- implementing flood emergency plans.

State control arrangements

Control arrangements involve the direction of response activities across agencies, including the coordination and tasking of other agencies.

When an emergency becomes a 'major emergency' (a large or complex emergency that has the potential to cause loss of life and extensive damage, adverse consequences to the Victorian community, or requires a multi-agency response) State Control arrangements are activated under the EM Act 2013.

State Control arrangements differ depending on the emergency:

- Class 1 – major fire, storm or flood
- Class 2 – any major emergency other than a class 1 or 3
- Class 3 – warlike or terrorist acts, hijacks, sieges or riots.²¹

In a Class 1 major emergency, like the Flood Event, or a Class 2 major emergency, the EMC is responsible for ensuring control arrangements are in place. In a Class 1, the EMC is also responsible for appointing a State Response Controller. The State Response Controller is supported by a State Control Team (SCT), which they chair, and includes the EMC (or their representative) as well as senior representatives from the response agencies involved. The State Response Controller may also be supported by Deputy State Response Controllers to assist with the management of specific elements of the emergency.

Ultimately, the EMC is responsible for the decisions of the State Response Controller in an emergency and can direct or override them if the EMC considers that control is not being exercised effectively. Throughout the Flood Event, several State Response Controllers were rostered on.

Control arrangements also include regional and incident controllers who are supported by regional and incident control teams and report to the State Response Controller regarding major emergency preparations and responses.

The SEMP²² offers detail on the roles and responsibilities of Control Agencies and Support agencies. In a Class 1 emergency, the Control Agency is the agency with primary responsibility for responding to the specific emergency.

Command arrangements

Command arrangements set out how an agency uses its people, resources, governance, systems and processes to direct response activities and discharge its responsibilities, in line with relevant legislation.

For example, during the Flood Event, the VICSES Chief Officer Operations was responsible for command of VICSES emergency response and rescue services (see chapter 5 for more about VICSES' responsibilities and activities during the Flood Event).

²¹ The term 'Class 3 emergency' is not used in the EM Act 2013, although it provides that warlike acts, acts of terrorism etc. are not class 2 emergencies. Rather, it is an operational term used to improve the readability and useability of the SEMP.

²² [Role statements | Emergency Management Victoria \(emv.vic.gov.au\)](https://emv.vic.gov.au/Role-statements/)

Coordination arrangements

Coordination arrangements involve bringing together people, resources, governance, systems and processes, to ensure an effective emergency response.

In a Class 1 or Class 2 emergencies, the EMC is responsible for coordinating agency **responses**, including when there are multiple, concurrent emergencies. The EMC chairs, and is supported by, the State Coordination Team which includes senior representatives from emergency management sector agencies.

Emergency Recovery Victoria (ERV) is responsible for coordinating **relief** activities at the State tier.

Coordination also operates:

- vertically within an agency (chain of command)
- horizontally across agencies as a function of the authority to control.

Consequence management arrangements

Consequence management focuses on the wider ramifications of an emergency, rather than immediate hazards. For example, a flood or fire may impact supply chains and lead to a fuel shortage. In both emergencies, the consequence – a community fuel shortage – requires a coordinated response across agencies to re-establish fuel supplies and end disruption.

Consequence management supports strategic decision-making before, during and after a major emergency. It is particularly important in longer-term decision-making and in helping support community recovery. It involves many different agencies and engaging the skills and services of non-government organisations responsible for managing or regulating affected services or infrastructure.

The EMC is responsible for consequence management. The EMC chairs and is supported by the State Emergency Management Team (SEMT) which includes senior representatives from agencies with portfolio responsibilities relevant to a particular emergency and representatives of business, industry or community groups best placed to assist.

2.4.3 Recovery

The recovery phase of an emergency involves providing assistance to affected people and communities so they can resume a proper and effective level of functioning. ERV is responsible for coordinating recovery activities at state and regional tiers, while local government manages them within their communities.

Under Victoria's emergency management arrangements, recovery is community-led and community-centred, responsive and flexible. Recovery activities are designed and implemented through engagement with communities and managed locally. Recovery can be scaled up to deal with more widespread, complex issues and support needs.

Flood recovery activities can include:

- emergency recovery of individuals, households, communities and industries or businesses
- public health surveillance programs
- emergency responses like removing residual water or environmental asset restoration
- community engagement and support.

Chapter 11 has further information about the recovery phase of emergency management and recovery activities in relation to the 2022 Flood Event.

2.4.4 Evaluation and continuous improvement

The Victorian emergency management sector supports a culture of continuous improvement by:

- validating existing emergency arrangements for different hypothetical scenarios – ‘exercising’
- encouraging the sector to share lessons on positive actions to sustain and areas to improve
- encouraging learning from assurance activities and national and international good practice
- improving how things are done, based on research and national and international good practice
- collaborating through pilot projects
- focusing on systems of work rather than the performance of individuals
- recognising that identifying and implementing sustainable solutions takes time, resources and opportunities.

Monitoring, evaluation and reporting activities during and after a major emergency can include:

- debriefing officers, teams and agencies
- reviewing the effectiveness of coordination, control, consequence management and communications functions
- an operational or system level review by EMV
- independent assurance activities by the IGEM – guided by the IGEM’s Assurance Framework for Emergency Management²³ for a coordinated sector-wide collaborative approach
- other independent assurance activities by the Victorian Government and the Victorian Auditor-General’s Office, or another independent monitor.

Lesson management

The Victorian emergency management sector *Lessons Management Framework*²² (‘the EM-LEARN Framework’) informs continuous improvement before, during and after emergencies. The Framework aligns with the *Australian Institute for Disaster Resilience: Lessons Management Handbook*²⁴ and is consistent with the *IGEM’s Assurance Framework for Emergency Management*.²⁵

The SCC Lessons and Evaluation (SLE) Unit focuses on supporting lessons and evaluation activities. These provide valuable information and ensure continuous improvement occurs before, during and after state-level emergencies. This capability aligns with the EM-LEARN Framework.²⁶

The SLE Unit supports the EMC and the State Response Controller in maintaining an overview of what has been learned about managing state-wide emergency events.

The SLE Unit also oversees Victoria’s real time monitoring and evaluation (RTM&E) capability. RTM&E is designed to work alongside those participating in emergency management activities and provide real time learnings to inform ongoing continuous improvement. It is used during the

²³ <https://www.igem.vic.gov.au/our-work/assurance-framework-for-emergency-management>

²² <https://www.emv.vic.gov.au/how-we-help/reviews-and-lessons-management/lessons-management-framework-em-learn>

²⁴ <https://knowledge.aidr.org.au/resources/lessons-management-handbook/>

²⁵ <https://www.igem.vic.gov.au/our-work/assurance-framework-for-emergency-management>

²⁶ <https://www.emv.vic.gov.au/how-we-help/reviews-and-lessons-management/lessons-management-framework-em-learn>

readiness and response phases of Class 1 and 2 major emergencies and the relief and early recovery phases of Class 1, 2 and 3 major emergencies.

RTM&E was deployed during the Flood Event to ensure learnings were shared and continuous improvements applied in real time.

2.5 Preparedness for and response to the 2022 Flood Event

Victoria's robust operational arrangements and broader foundational arrangements supported preparedness for, and the response to, the Flood Event.

2.5.1 Preparedness for the Flood Event

In September 2022, the seasonal outlook identified a high likelihood of significant rainfall, and potential flash flooding and riverine flooding, between October 2022 and March 2023. Departments and agencies undertook planning, preparedness and readiness activities. Activities included:

- 'exercising'
- educating stakeholders and potentially affected industries and communities
- ensuring adequate resources, expertise, systems and processes were in place
- having mechanisms in place across government and industry to support communities
- proactive, targeted and tailored agency briefings with a focus on coordination arrangements.

Exercising

A flood exercise was held in the SCC on 19 September 2022. It was based on a hypothetical flood scenario in regional Victoria and involved multiple emergency management agencies, including VICSES. The exercise was designed to test and practise the sector's response and relief arrangements in a flood and involved two SCT meetings – the first considering flood readiness and the second considering relief activities once the event peaked. The Minister for Emergency Services participated in the exercise.

Communications

A strategic communications plan was set up to ensure timely, tailored public information to the community before, during and after the Flood Event.

All emergency broadcasters were contacted and alerted to anticipated flooding on Monday 10 October 2022. The EMC, Bureau of Meteorology (BoM) and VICSES' Chief Operational Officer held a media conference about it at the SCC on Tuesday 11 October 2022.

Public communications campaigns were also rolled out before, during and after the Flood Event, between 9 October and 30 November 2022. They included:

- *15 to Float* – creating awareness about the risks of driving into floodwaters
- *Be Flood Ready* – advising on how to prepare homes for flood (Bag it, Block it, Lift it and Leave).

Both campaigns focused on key protective actions that community members could take to stay safe and protect property. They were delivered across a range of media channels including radio (metro and regional); social media; broadcast video on demand (7Play, 9Now, SBS on demand); and search engine marketing. The radio and social media campaigns were tailored to reach culturally and linguistically diverse communities.

Other strategies included:

- using the Emergency Management Joint Public Information Committee (EMJPIC) to ensure coordinated and consistent messaging across whole-of-Victorian-government channels with maximum reach at all stages of the emergency
- using all available channels – including the VicEmergency app, website, hotline and social media – to deliver coordinated, consistent and strategic messaging reminding Victorian communities to stay up to date and never rely on one source for emergency information
- holding daily SCC media conferences, delivered by a range of spokespeople, to tell the community about potential flooding and encourage them to heed warnings. These conferences were supported by localised information and warnings.

Readiness

Before an expected flood event, the control agency VICSES, is advised by either the BoM Regional Forecasting Centre or the SCC BoM weather service. The VICSES Chief Officer Operations notifies the EMC who, via the SCC notifies the SCT.

VICSES Flood Readiness and Activation Triggers Considerations employ a six-level readiness framework for notification and escalation arrangements in flood responses.

Readiness Level	RL 1 Low to Moderate	RL 2 High	RL 3(A) Very High	RL 3(B) VERY HIGH	RL 4 SEVERE	RL 5 EXTREME
Operations	VICSES managed			Multi-agency response		

Severe weather conditions were expected from Thursday 13 October to Saturday 15 October 2022, triggering readiness levels 3B, 4 and 5. This moved the response from 'business as usual' led by VICSES, to a multi-agency response managed via state control arrangements.

The SEMT met on Tuesday 11 October 2022 to support the State Response Controller. Consistent situational awareness was required and strategic risks and consequences needed to be identified and managed.

The SCT met on Wednesday 12 October 2022. SCT implements the strategic context of operational readiness for, response to, and where appropriate the integration of response, relief and transition to recovery for a major emergency. Incident management team (IMT) readiness was enacted on that day, with regional control in place from 8am.

Incident control centres were set up in areas of potential impact. The Country Fire Authority (CFA), VICSES, Forest Fire Management Victoria (FFMVic) and Fire Rescue Victoria (FRV) had IMTs at state, regional and local operational level.

The SCC was activated to Tier 3 – the highest level – on Wednesday 12 October 2022 when flooding started, escalating from Tier 2 on Tuesday 11 October 2022. This meant that appropriate agencies were brought in to prepare for, respond to, and provide early recovery from a major emergency.

2.5.2 Response to the Flood Event

Volunteers and career emergency services personnel worked around the clock, across Victoria, to respond to the Flood Event. Response efforts focused on reducing impacts on people, critical infrastructure, property, businesses, communities and environments.

As the event unfolded, the Victorian Government, working with local councils, communities and the Australian Government, implemented immediate response, relief and early recovery activities.

Interstate and Commonwealth assistance supported IMTs, flood, boat and in-water rescue crew, as well as sandbagging operations.

Details about the response to the Flood Event are contained throughout the submission. Key highlights are provided below.

VICSES

VICSES volunteers, in collaboration with sector partners, strengthened flood defences, evacuated communities, and responded to thousands of requests for assistance. Between 6 October 2022 and 3 January 2023, VICSES received 20,062 requests for assistance (RFAs). They responded to over 900 flood rescues in support of Victoria Police, alongside other partners including Life Saving Victoria (LSV) and Fire Rescue Victoria (FRV), and boat crews from the Victorian Fisheries Authority and Transport Safety Victoria. See Chapter 5 for more on VICSES' role.

Commonwealth and interstate assistance

Under Defence Assistance to the Civil Community (DACC) arrangements, state and territories can request Australian Defence Force (ADF) assistance. This was requested and deployed through local ADF liaison with relevant incident control centres. On 13 October 2022, the first ADF resources were deployed in flood affected communities.

A formal request for Australian Government non-financial assistance was made by the EMC on 15 October 2022 to seek further support from the ADF, via DACC 2 provisions. On 20 October 2022 approximately 400 ADF personnel and high clearance vehicles were assisting residents in affected areas.

With ADF assistance, many sandbags were received and dispatched, including those already held at units or in local communities, and some from interstate and overseas. The total number of sandbags employed was the highest ever during a Flood Event – around 1.5 million.

In the week of 24 October 2022, personnel from Queensland Fire and Emergency Services, the Western Australia Department of Fire and Emergency Services and South Australia Emergency Services, were deployed across Victoria to assist with response, relief and recovery efforts. These resources were requested through the Australasian Arrangement for Interstate Assistance, Fire and Emergency Services.

Interstate and Commonwealth assistance supported IMTs, flood boat and in-water rescue crew, as well as sandbagging operations.

Air assistance

Aircraft were in position to support Flood Event responses on 12 October 2022.

One example of their contribution was to transport essential service workers. They enhanced the emergency service response and complemented ground crews, providing a vital service when crews needed to respond to incidents in isolated locations with limited access.

VICSES, CFA and Shepparton Search and Rescue adapted to flood conditions across parts of Victoria by assembling an interim helicopter-based road crash rescue team to respond to incidents in isolated communities. This commenced on 20 October 2022 and was ready to respond from Mangalore airfield throughout the Flood Event.

Public information and warnings

Proactive, targeted and tailored public awareness messaging and warnings were provided throughout the Flood Event and included several community meetings in affected areas.

On Thursday 13 October, 220 community warnings were sent, more than previous 'record' of 209 on 30 December 2019 during the 2019–20 Black Summer bushfires. Just the next day, Friday 14 October, saw 285 community warnings issued.

Warnings intensified as floodwaters travelled through the river systems, north to the Murray River. Chapter 4 has more information about Flood Event warnings.

3. Causes of and contributors to the Flood Event

Key points

While it is not currently possible to attribute climate change to individual events, such as the Flood Event, there is clear scientific evidence that climate change is leading to more intense rainfall and under some conditions is increasing the risk of flooding events over time.

La Niña weather patterns, which have been in effect over the past three years, are associated with above-average winter–spring rainfall for Australia, particularly across the east and north.

3.1 Introduction

On 13 September 2022, for the third consecutive year, the BoM declared a La Niña event. Modelling suggested it would be a relatively short-lived event, peaking in spring and easing in early 2023. Occurring simultaneously, a negative Indian Ocean Dipole (IOD) and positive Southern Annular Mode (SAM) exacerbated the potential for increased rainfall.

On 29 September 2022, BoM issued a climate outlook for October to January. The forecast noted a very likely (greater than 80 per cent) chance of above median rainfall for much of eastern Australia, particularly between 3–16 October 2022. During that fortnight, the region had at least twice the average chance of unusually high rainfall, putting it in the wettest 20 per cent of fortnights for that time of year between 1981–2018. The area identified with the highest potential for unusually high rainfall extended from the Top End of the Northern Territory into south-west Queensland, to west of the Great Dividing Range in NSW and the central north of Victoria.

The spring of 2022 was wetter than average across most of Victoria, with large parts of northern and western Victoria recording their wettest spring. September was the wettest since 2010, October 2022 rainfall was the highest for any month since records began in 1900, and November 2022 rainfall was the fifth highest on record for that month.

The severe and widespread floods in northern Victoria in 2010–11, 2012, and the 2022 Flood Event are a stark reminder to Victorians that the risk from flood is very real and exists in many parts of the state, including urban areas.

Flooding is mainly caused by heavy rainfall that exceeds the collection capacity of water courses, storage bodies and drainage systems. Floods are generally classified as:

- riverine – when rivers, streams or lakes overflow
- stormwater flooding – when the capacity of drainage systems is exceeded and water can flow in normally dry and often impervious urban areas.

Flood waters can often rise rapidly and flow with high velocity, posing a greater threat to human life, particularly for stormwater or riverine flooding in the upper catchments. This is generally called flash flooding because warning times are very short. Coastal flooding, when land adjacent to the coastline or coastal waterways is inundated by either high tides or storm surges or both, also occurs in Victoria and can be exacerbated by wind-wave generation from storm events.

While flooding is a natural occurrence and has a positive impact on wetlands and replenishment of soil moisture and nutrients, human settlement on floodplains and close to rivers has also contributed to increased flood risks.

3.2 Distribution of the flood hazard across Victoria

Floods of different sizes cause different amounts of damage and the size of a flood is linked to the probability of its occurrence. That probability of flooding is modelled under a range of events

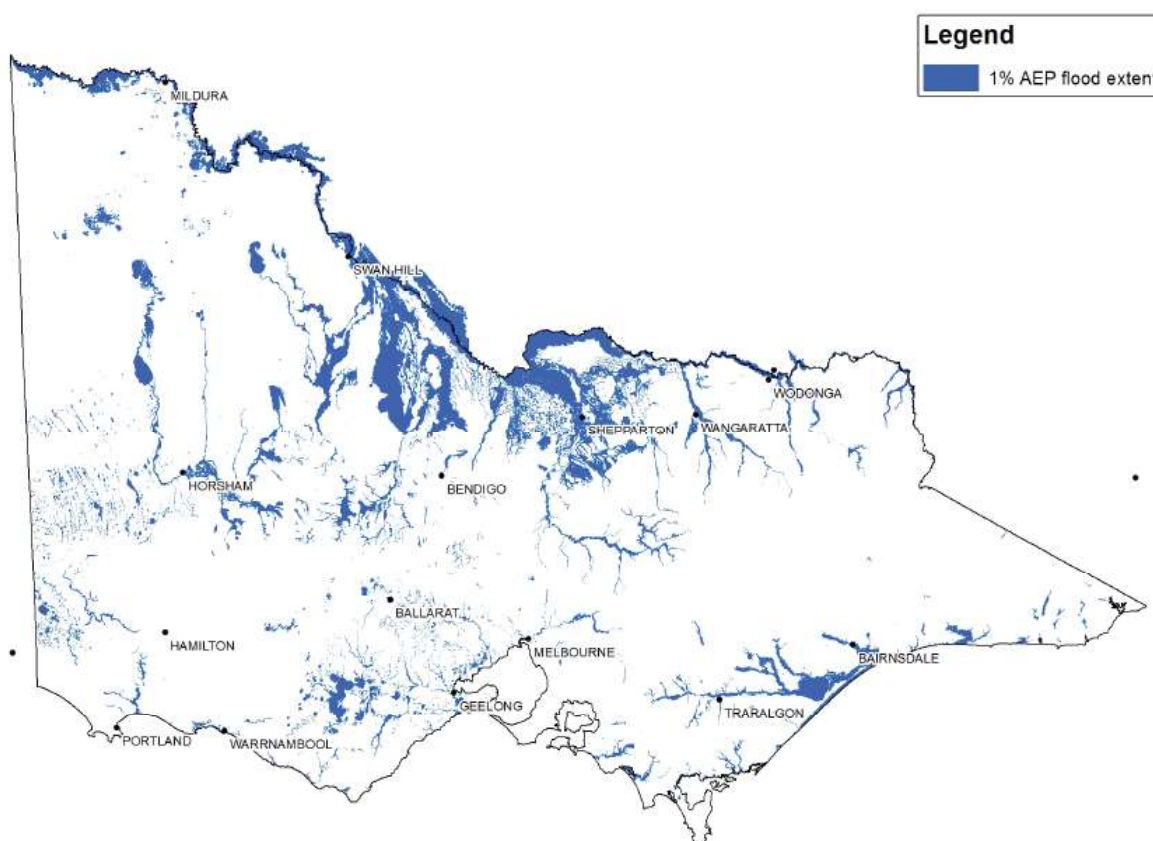
typically 1 in 20 year or 5 per cent Annual Exceedance Probability (AEP) up to probable maximum possible flooding, greater than 1 in 1000 or 0.1 per cent AEP.

One layer of particular importance for land use planning shows the 1 per cent AEP or 1 in 100-year flood extent (Figure 1). Other layers produced from flood studies show levels and extents that are critical for emergency management planning and response. These layers are also critically important in enabling insurance premiums to reflect risk accurately.

In order to identify the areas that need to be subject to planning and building controls, it is necessary to decide an appropriate threshold frequency of flooding. This frequency is known as the 'design flood event' (DFE).

The *Review of the 2010–11 Flood Warnings and Response* questioned if the 1 per cent AEP flood should still be used as the DFE in Victoria. The Victorian Government determined that the 1 per cent AEP flood is the appropriate standard to regulate and protect most forms of development through the planning and building systems.

Figure 1: Map of Victoria showing flood hazard distribution.²⁷



3.3 Climate change

Information presented in this section is drawn from peer reviewed sources – the Intergovernmental Panel on Climate Change (IPCC) *Sixth Assessment Synthesis Report 2023*, *State of the Climate 2022*, *Victoria's changing climate 2021*, *Victoria's water in a changing climate 2021* and *Victoria's Climate Science Report 2019*.

²⁷ [Emergency risks in Victoria July 2020](#). Emergency Management Victoria.

There is clear evidence that climate change is leading to more intense rainfall events and under some conditions, such as in urban areas and small catchments, is increasing the risk of flooding events over time. What is less clear is how climate change-related intense rainfall will lead to flooding in catchments that are drier because of an overall decrease in average rainfall.

The role of climate change in flooding is an active area of scientific research and it is therefore not possible to attribute the specific contribution of climate change to individual events, such as the Flood Event. Nonetheless, the evidence that climate change is increasing flood risk under some conditions indicates a corresponding influence on flood events over time.

3.3.1 Changes in the global climate system²⁸

In its latest report the IPCC concludes that, with global surface temperatures now about 1.1 °C higher than pre-industrialisation, the climate system is warming rapidly and almost everywhere. It is unequivocal about the effects of human-induced warming of the atmosphere, ocean, land and climate, which are driving weather and climate extremes in every region across the globe.

Global mean sea level increased by 0.20 m between 1901–2018, while the average annual rate of sea level rise has increased from 1.3 millimetres (mm) per year between 1901–71 to 1.9 mm per year between 1971–2006, and 3.7 mm per year between 2006–18. Human influence is very likely²⁹ the main driver of the increase since at least 1971. Changes such as sea level rise, caused by ocean warming and melting ice sheets, are irreversible for centuries to millennia.

Evidence of observed changes in extremes such as heatwaves, heavy precipitation and droughts, and in particular, their attribution to human influence, has strengthened. Human influence has also likely increased the chance of compound extreme events since the 1950s.

Australia's changing climate³⁰

According to *State of the Climate 2022*, Australia's climate has warmed by an average of 1.5 °C since national records began in 1910.

There has been a decrease in streamflow at most gauges across Australia since 1975, with the exception of parts of northern Australia, and an increase in extreme fire weather, with a longer fire season across large parts of the country since the 1950s.

Oceans around Australia have warmed by more than 1 °C since 1900 and continue to become more acidic, with changes happening faster in recent decades. Sea levels around the country are rising, which, together with more frequent extreme weather events, increases the risk of inundation and damage to coastal communities and infrastructure.

In the coming decades, Australia is projected to experience continued:

- increases in air temperature with more heat extremes and fewer cold extremes
- average decreases in cool season rainfall across southern and eastern Australia, likely resulting in more time in drought giving rise to short-duration heavy rainfall events
- increases in the number of dangerous fire weather days and longer fire seasons for southern and eastern Australia

²⁸ [Sixth Assessment Synthesis Report 23 March 2023, International Panel on Climate Change.](#)

²⁹ IPCC-assessed likelihood of an outcome or result, per cent probability: virtually certain 99–100 per cent; very (or extremely) likely 90–100 per cent; likely 66–100 per cent; more likely than not 50–100 per cent; likely as not 33–66 per cent; unlikely 0–33 per cent; very unlikely 0–10 per cent; extremely unlikely 0–5 per cent.

³⁰ [State of the Climate 2022.](#) Bureau of Meteorology, CSIRO.

- sea level rise.

Victoria's changing climate³¹

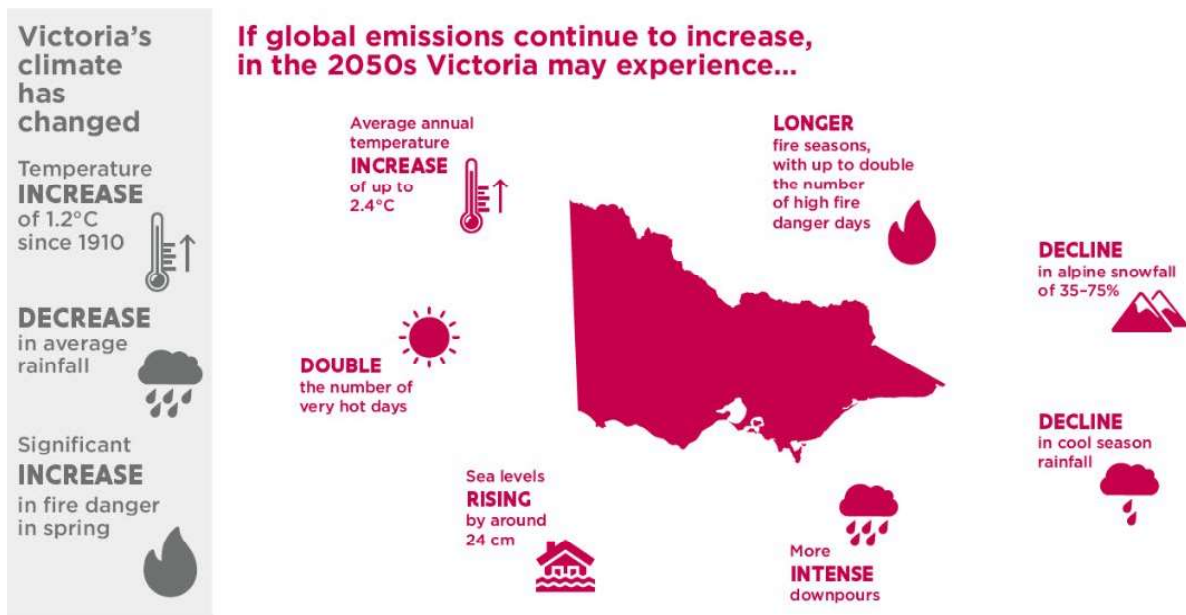
Observational data from the BoM shows that Victoria's climate has warmed by 1.2 °C since records began in 1910³² and the state has become drier (see 3.3.2). There has also been:

- more warm than cool years since the 1960s
- an overall increase in the frequency of unusually hot days
- a greater number of very high fire danger days in spring.

Victoria's mean sea level has also been increasing, with tide gauges showing average increases between 1.57–5.31 cm per decade between 1993–2017.

Projected changes in Victoria's future climate under a high greenhouse gas (GHG) emissions scenario are illustrated in Figure 2. In the 2050s the average annual increase in temperature could reach 2.4 °C, with a consequential increase in the number of very hot days, a decline in cool season rainfall, and more intense rain events.

Figure 2: Changes in Victoria's climate under a high greenhouse gas emissions scenario.³³



Under high emissions, compared to 1986–2005. Updated from Victoria's Climate Science Report 2019

³¹ [Victoria's changing climate \(climatechange.vic.gov.au\)](https://climatechange.vic.gov.au); [Victoria's Climate Science Report 2019](#) (Department of Environment, Land Water and Planning).

³² Note that the difference in average temperature between the 2019 figure for Victoria and 2022 figure for Australia is due to the different regions and additional years of observational data.

³³ [Victoria's changing climate \(climatechange.vic.gov.au\)](https://climatechange.vic.gov.au).

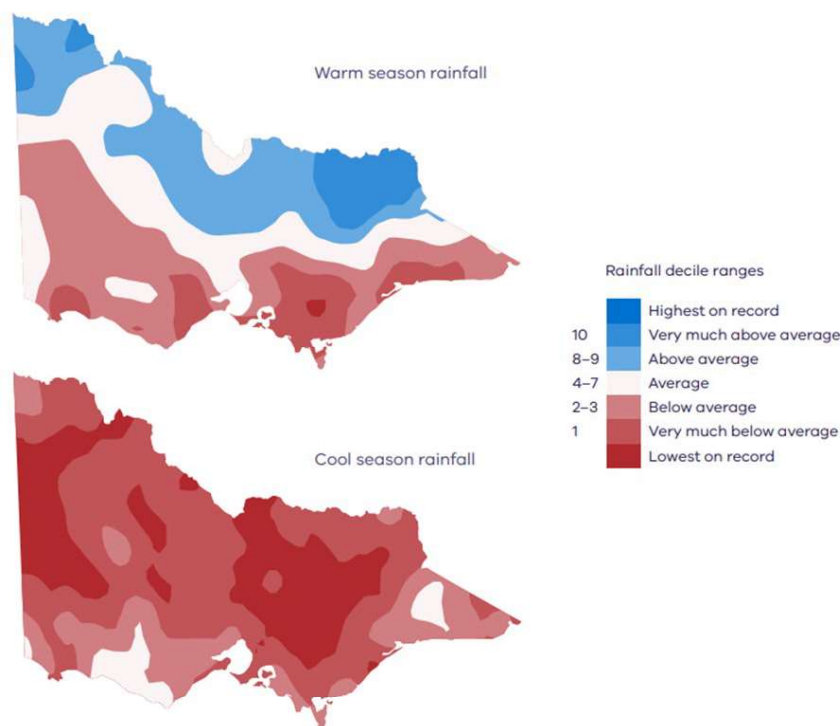
3.3.2 Climate factors influencing rainfall

Australian rainfall is highly variable and is strongly influenced by climate drivers such as El Niño, La Niña, the IOD and the SAM.³⁴ Despite this natural variability, long-term trends are evident in Australia's rainfall records. There has been a shift towards drier conditions across the south-west and south-east of the country, with more frequent years of below-average rainfall, especially for the cool season months of April–October.³⁵ In 19 of the 22 years from 2000–21, cool season rainfall in southern Australia has been below the 1961–90 average, primarily due to a combination of changes in large-scale circulation caused by climate change.³⁶

Victoria has also become drier, especially in the cooler months, with cool season rainfall declining over the past 30 years compared to last century (Figure 3). This is due to changes in global wind and ocean movements in the Australian region that are consistent with global warming, although natural variability is also likely to be a factor.³⁷

Figure 3 illustrates the observed changes in warm and cool season rainfall for the last 30 years compared to each 30-year period in the historical record. For example, in the lower map, 'very much below average' rainfall (red colours on the map) are areas where rainfall over the past 30 years is in the lowest 10 per cent of all such 30-year periods in the full range of long-term records back to 1900. A trend for an increase in rainfall for northern Victoria is shown in the warm season (blue colours in the top map).

Figure 3: Observed rainfall change in Victoria for the last 30 years (1989 to 2018–19).



³⁴ [State of the Climate 2022](#). Bureau of Meteorology, CSIRO; [Victoria's Climate Science Report 2019](#). Department of Environment, Land Water and Planning); [Victoria's changing climate \(climatechange.vic.gov.au\)](#).

³⁵ [State of the Climate 2022](#). Bureau of Meteorology, CSIRO.

³⁶ [State of the Climate 2022](#). Bureau of Meteorology, CSIRO.

³⁷ [State of the Climate 2022](#). Bureau of Meteorology, CSIRO.

Global climate models project that Victoria’s cool-season downward trend in rainfall is likely to continue. Current observations are tracking at the drier end of these projections (Figure 4).³⁸

Figure 4: Cool season (April–October) rainfall declines are projected to continue (on average).

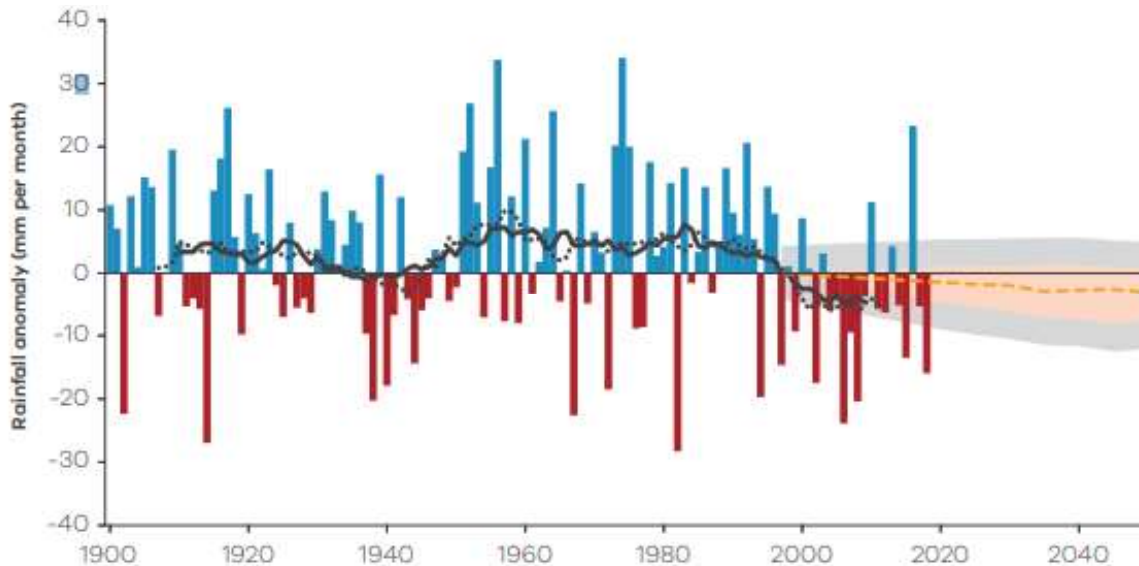


Figure 4 details the observed cool-season rainfall anomalies for Victoria (mm per month) from 1976–2018. The black lines represent 20-year and 15-year running averages. The coloured wedge (right-hand side) represents the projected rainfall across 40 global climate models, with the dashed orange line as the middle of the range and the pink shaded area as the 10th–90th percentiles range of the 40 models. The observed 1900–2018 decadal variability (in grey) is added.

3.3.3 Extreme rainfall events and flood risk

The intensity of short-duration (hourly) extreme rainfall events has increased by around 10 per cent or more in some regions across Australia in recent decades.³⁹ In Victoria, even though average total rainfall is declining, short-duration rainfall events are becoming more intense.⁴⁰

As the climate warms, the atmosphere can hold more water vapour; approximately seven per cent more per degree of warming, and increased atmospheric moisture can provide more energy for some processes that generate extreme rainfall events.⁴¹ As a result, by the end of the century, extreme rainfall events in Victoria are expected to become more intense⁴², and may lead to flooding. When and where the extreme rainfall events will occur will remain highly variable.⁴³

There are multiple factors that lead to flooding. A critical factor is how extreme a rainfall event is. Other factors include how wet or dry catchments are prior to the rainfall event. In estuarine and coastal environments, tides and sea levels can also be important. Flood risk is also influenced by

³⁸ [Victoria’s water in a changing climate 2021](#). Bureau of Meteorology, CSIRO, University of Melbourne, Department of Environment, Land Water and Planning.

³⁹ [State of the Climate 2022](#), (Bureau of Meteorology, CSIRO, December 2022).

⁴⁰ [Victoria’s Water in a Changing Climate 2021](#), (Bureau of Meteorology, CSIRO, University of Melbourne, Department of Environment, Land Water and Planning)

⁴¹ [State of the Climate 2022](#), (Bureau of Meteorology, CSIRO, December 2022).

⁴² [Victoria’s Water in a Changing Climate 2021](#), (Bureau of Meteorology, CSIRO, University of Melbourne, Department of Environment, Land Water and Planning)

⁴³ [Victoria’s Water in a Changing Climate 2021](#), (Bureau of Meteorology, CSIRO, University of Melbourne, Department of Environment, Land Water and Planning)

topography and the risk can change over time as a result of changes in land use and land cover, and the extent to which streams in the catchment area are regulated.

With extreme rainfall events projected to become more intense in a warmer world, flood risk in urban areas and small catchments is expected to increase. The impact on medium and large catchments in Victoria is less certain because of the compensating effect of more intense extreme rainfall versus projected drier antecedent conditions. ⁴⁴

In regard to the Flood Event, as the attribution of climate change to individual flooding events is an active area of scientific research, it is currently not possible to confirm the role of climate change in the Flood Event. Nonetheless, the evidence that climate change is increasing flood risk under some conditions indicates a corresponding influence on flood events over time.

⁴⁴ [Victoria's Water in a Changing Climate 2021](#), (Bureau of Meteorology, CSIRO, University of Melbourne, Department of Environment, Land Water and Planning)

4. The Flood Event and the Victorian Warning System

Key points

Chapter 4 describes how the Victorian Warning System was used in the Flood Event, and outlines the framework for identifying flood risks, providing information and warnings to the community, how these arrangements operate and the role of key agencies.

Victoria continues to improve the access to public information and warnings, particularly for isolated and culturally and linguistically diverse communities.

4.1 Introduction

The 2022 Flood Event was widespread and prolonged (13 weeks). All channels in Victoria's integrated warning system were employed to inform communities of risks and advise them of appropriate action to protect lives and minimise impacts.

In total, 4758 riverine flood warnings were issued through Vic Emergency channels over the 89 days between 6 October 2022 and 3 January 2023. In addition, 17 Emergency Alert campaigns were issued in October, with an SMS and/or call to a landline providing critical information about the emergency and how to stay safe.

Friday 14 October 2022 was the single biggest day on record for community warnings through Vic Emergency in the state, with 285 warnings issued. This surpassed the record of 220 set the preceding day (Thursday 13 October). The number of warnings on 30 December 2019 during the 2019–20 Black Summer bushfires was 209.

In addition to Vic Emergency channels, localised and state-wide direct engagement with media outlets (print, radio, TV) were undertaken, further promoting the public information and warnings. Community Officers were also deployed to ensure effective two-way communication between effected communities and the IMT - and responding to needs of communities by undertaking door knocks, setting up community information points at local landmarks/community points of interests as well as more formalised community meetings.

4.2 Victoria's warning system

Providing effective public information and warnings enables the community to act – to prevent the loss of life and to limit material, infrastructure and economic damage.

Public information is provided immediately before, during and after an emergency to reduce its potential impact. Warnings provide point-in-time information about a hazard that is impacting or expected to impact communities. They describe the impact and expected consequences and include advice on what people should do.

The Victorian Warning System provides information and warnings to communities through a range of channels including:

- VicEmergency – VicEmergency channels provide a centralised location for Victorians to access timely emergency information and warnings.
- Emergency broadcasters – The Victorian Government has formal arrangements for the broadcast of community warnings and information to the community. This can also include broadcasting through social media channels.
- Emergency Alert – Emergency Alert is used to send a voice message to landline telephones and a text message to mobile phones.

- Local automated warning systems – These include community sirens, speakers and roadside signage.
- Face-to-face – This includes door knocking, community meetings, and virtual ‘town hall’ meetings conducted over live radio or web feeds such as Zoom.

4.2.1 Total Flood Warning System

Flood warnings serve to inform flood management agencies and people in flood-prone communities about developing floods so they can take action to mitigate the effects.

A flood warning system is made up multiple components that need to be integrated to operate effectively. Since the 1990s, flood warning systems have been structured around the concept of the Total Flood Warning System (TFWS). The system is promoted by the Australian Government and is widely used in the design of early flood warning systems, including in Victoria.⁴⁵

The *Application of the Total Warning System to Flood*⁴⁶ provides broad guidance for the application of the holistic Total Warning System for flooding.

The components of the TFWS are:

- monitoring rainfall and river flows that may lead to flood
- prediction of flood severity and time of onset for particular levels of flooding
- interpretation of predictions to determine likely flood impacts on the community
- construction of warning messages describing what is happening, what will happen, the expected impact and what actions should be taken
- issue of warning messages
- response to warnings by agencies and communities.

Functions are performed within the framework of the *Victorian Warning Arrangements* and the *Victorian Floodplain Management Strategy* (discussed in chapter 6).

4.2.2 Victorian Warning Arrangements

The *Victorian Warning Arrangements*⁴⁷ establish governance arrangements for the issue of emergency warnings. The arrangements were developed in line with the nationally agreed principles for warning policy and practice, set out in the *Public Information and Warnings Handbook*.⁴⁸ The handbook explores the essential elements and discipline of effective public information and warning delivery.

The arrangements are based on an all-hazards approach, with Victoria broadening this to consider all communities and all emergencies. This approach aims to ensure that any information or warnings issued are authoritative, consistently constructed, timely and appropriate. Delivery of information and warnings is via responsible control agencies and uses all channels in the integrated Victorian Warning System.⁴⁹

⁴⁵ [The Total Flood Warning System: a review of the concept. Australian Journal of Emergency Management, January 2021 \(aidr.org.au\).](https://knowledge.aidr.org.au/media/9243/aidr_flood_warning_companion_2022.pdf)

⁴⁶ https://knowledge.aidr.org.au/media/9243/aidr_flood_warning_companion_2022.pdf

⁴⁷ <https://www.emv.vic.gov.au/responsibilities/victorias-warning-system/victorian-warning-arrangements#:~:text=The%20Victorian%20Warning%20Arrangements%20was.potential%20or%20actual%20emergency%20event>

⁴⁸ <https://knowledge.aidr.org.au/resources/handbook-public-information-and-warnings/>

⁴⁹ <https://www.emv.vic.gov.au/responsibilities/victorias-warning-system>

The roles and responsibilities for issue of warnings, and an outline of the key principles for delivery to the community, are set out in the arrangements. They require warnings to be:

- **Tailored** – Warnings are required to include specific details about the emergency and likely or actual impacts on the community. Where possible, input of local knowledge is required.
- **Timely** – Warnings must be authorised as a priority, with initial information issued in the shortest time practicable and updates provided in a timely manner. Warnings should be updated regularly.
- **Relevant** – Warnings must contain explicit information about severity, location, predicted direction and the likelihood of impact on communities. Advice on protective actions should be relevant to the incident and community impacted.
- **Accessible:** Warnings must be provided through multiple channels and in plain language.

4.2.3 Roles and responsibilities for flood warnings

Bureau of Meteorology

The *Meteorology Act 1955* (Cth) sets out the functions of the Bureau of Meteorology (BoM). These include the issue of warnings of gales, storms and other weather conditions likely to endanger life or property or give rise to floods.

Official forecasts and warnings for extreme weather and flood events are issued for:

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

BoM provides forecasts for predicted levels or flood-class levels (minor, moderate and major) for some locations in Victoria. The prediction may be quantitative, qualitative or generalised and includes height and timing information, where available. This level of service does not operate in all flood risk locations across Victoria.

BoM service level standards define the nature and type of warnings provided for various locations across Victoria. Prediction locations are categorised into three types:

- forecast
- data
- information.

For the larger Melbourne metropolitan catchments, the flood prediction services function is performed by Melbourne Water, but the BoM still issues all flood watches and flood warnings for these catchments.

Under BoM *Service Level Specification for Flood Forecasting and Warning Services for Victoria* (the SLS), flood forecasting and warning services are confined to riverine flooding, where typical rain-to-flood times are six hours or more. Flash flooding (rain-to-flood times less than six hours) and flooding caused by elevated sea levels are not covered. Neither are weather forecasting and other services BoM provides that may contribute to flood forecasting and warning services, such as:

- severe thunderstorm and other weather warnings
- provision of radar data
- rainfall forecasts.

BoM provides essential data and services to jurisdictions for strategic, operational and tactical decision-making. It's important that these services be maintained, funded and supported so the specific needs of each jurisdiction can be met. This means that BoM data and services should be provided in real-time, working with emergency managers in situ, and reflect detailed understanding of local and regional conditions.

Victoria State Emergency Service

Victoria State Emergency Service (VICSES) coordinates community notifications and warnings for floods, storms and landslides (as well as other hazards), in conjunction with other relevant authorities.

Impacts of flood and storm events will vary between locations depending on the size and nature of each event. Before issuing community notifications and warnings, VICSES considers the forecast scale, category, and actual or potential community consequences. Where possible, community notifications and warnings are tailored to the individual community at risk.

VICSES, BoM and Melbourne Water work in close partnership to ensure the timely notification of flood events in Victoria. VICSES' notification process for floods is documented in VICSES Standard Operating Procedures (SOPs) and in relevant emergency management sector Joint Standard Operating Procedures (JSOPs).

VICSES must be proactive in early warnings to the community regarding the potential for floods and their associated impacts. It leads the coordination of business rules that govern the issue of community notifications under the Australian Warning System (AWS) for flood. The business rules set triggers for the three warning levels:

1. Advice
2. Watch and Act
3. Emergency Warning

VICSES uses the state-endorsed, multi-hazard warning platform, EM-COP Public Publishing, to disseminate public information and warnings to communities via VicEmergency and its associated channels. Recipients of VicEmergency warnings include emergency broadcasters (commercial and ABC radio) who are required to re-disseminate warning information and sound the Standard Emergency Warning Signal (SEWS), if required, in accordance with the Emergency Broadcasting Practice Note and the agreed memorandum of understanding.

Melbourne Water

Melbourne Water acts as the flood prediction agency for larger Melbourne metropolitan catchments. These include the Yarra, Maribyrnong, Westernport, Dandenong Creek, Werribee, Diamond Creek, Merri Creek, Kororoit Creek and Plenty River.

Ahead of and during a flood event Melbourne Water's role is to undertake modelling to estimate the likelihood and extent of flooding, based on rainfall forecasts and actual river height measurements. BoM provides the rainfall forecasts that Melbourne Water relies upon. During a heavy rainfall event, Melbourne Water resources a 24/7 flood warning roster, and is in regular contact with the BoM to ensure that up-to-date rainfall forecasts are included in the flood forecast modelling.

If a flood of moderate level or greater is predicted, the Melbourne Water Flood Response Plan is activated. This means that Melbourne Water stands up an incident response team. Melbourne Water runs its flood forecast models throughout a flood event. When a 'minor' or 'moderate' flood is predicted, model runs are updated every 24 hours. When a 'major' flood has been forecast model runs are updated every six hours. The six-hour cadence reflects the 'rain to flood' times set out in the SEMP. Additional model runs may be completed if real time river level data is deviating from the forecast levels.

The BoM will disseminate official flood watches (providing a heads up to communities about potential flood risks (Flood Watches) and flood warnings (containing rainfall forecasts and flood predictions) (Flood Warnings) for key locations on rivers and creeks. For the Melbourne metropolitan catchments, Melbourne Water prepares and sends Flood Warnings to the BoM. The BoM is responsible for the issue of Flood Warnings to VICSES and the community. In accordance with the SLS, the BoM issues Flood Warnings for the Melbourne metropolitan catchments within 30 minutes of predictions being received from Melbourne Water and the BoM being notified.

Water storage owners

Water storage owners are required to advise the BoM that the increased flow is expected to be at or above flood thresholds (i.e. minor, moderate or major flood level) in order for flood warnings to be issued. They also contact immediate downstream landholders where it is outlined in their storage flood plans.

Flood analysts

Flood analysts deployed in SCC and ICCs look at a range of factors such as BoM flood forecasts, observed and modelled flood extents, and topography to inform likely-affected communities and services. They work closely with BoM meteorologists and hydrologists, and use FloodZoom, a flood intelligence platform.

Flood analysts use a combination of forecast and field-verified data in their assessments. It's important that they're notified whenever more detailed information is obtained (for example, flood level observations, closed roads, affected infrastructure) or if on-ground conditions differ significantly from those predicted.

Flood analysts can assist in decision-making before, during and after an incident. They provide a variety of services including:

- identification of areas and times of greatest risk
- flood extent prediction maps, showing likely flood progression and potential impact zones
- advice on incident objectives, strategies and tactics
- information on factors impacting the spread and behaviour of a flash or riverine flood.

To support safe and effective operations, it's critical for flood analyst intelligence to be shared with incident management team (IMT) members and field personnel via initial impact assessments and briefings.

4.2.4 Flood intelligence

Flood intelligence supports decision making and planning, including public information and warnings, by providing reliable and accurate information on:

- the expected level, depth, and velocity of floodwater and its consequences
- determining actions to be taken in response to these.

Catchment management authorities (CMAs), the Department of Energy, Environment and Climate Action (DEECA), VICSES, other agencies, and trusted local sources (as appropriate) need to ensure that available sources of flood information are utilised.

DEECA maintains the FloodZoom platform – the state's central repository of all near real-time and historic flood data. It assists VICSES and other emergency services agencies in identifying the

possible local consequences of flooding. It's also used by CMAs in land use planning and flood risk assessments.

Flood intelligence, the FloodZoom platform, and their role is discussed in greater detail in the context of the *Victorian Floodplain Management Strategy* in Chapter 6.

4.2.5 The Victorian streamflow gauging network

A vital part of the flood warning system is the Victorian streamflow-gauging network and its 780 active river level and rainfall gauges across Victoria. These are maintained through two regional water monitoring partnerships which involve DEECA, local government areas (LGAs), CMAs, Melbourne Water, and other water corporations with an interest in the use of gauge data.

The partnership approach allows data to be collected once, and to a well-defined standard. It also allows data to be used for multiple business needs, such as water resource assessments, water allocation management, river health management, compliance monitoring, and flood warnings. DEECA manages regional partnership contracts and Melbourne Water manages equivalent contracts within the Port Phillip and Westernport regions.

Around 283 of the gauge sites are used for primary flood warnings. These provide vital, real-time river height data. Other sites provide further backup data and flash flooding information.

To supplement the permanent gauging network, DECCA maintains additional portable loggers which can be deployed at short notices during an event on request from ICCs. During the 2022 floods 21 loggers were deployed in various location across the state.

The network feeds information straight to BoM so it can predict flood severity and the timing of particular levels of flooding. BoM then develops warning messages and distributes them to response agencies, selected media and the community.

DEECA continues to upgrade river and rainfall gauges across the state so they can provide the necessary real-time data needed during emergencies. For example, in evaluating the impacts of the 2019–20 fires in the East Gippsland and north east regions, DEECA discovered that the gauges serviced by a single form of telemetry (typically the Next G cellular data network) were more vulnerable to fire-induced service outages than those with dual telemetry. This was an important discovery given single telemetered gauges accounted for a significant percentage of the approximately 130 automated river and rain-monitoring gauges in the two regions. Around 70 are relied on to support flood warning and forecasting services.

With technical support and recommendations from BoM, DEECA is working with relevant LGAs to identify flood warning gauges with limited or no telemetry service, and to add either radio or satellite-based telemetry. This will build resilience into the network, ensuring real time river level and rainfall data continues to be available to BoM, and residents, even in the midst of fire or flood.

DEECA is also installing new rainfall and streamflow gauges at priority locations identified via regional floodplain management strategies. Many of these are being used in innovative ways. For example, an electronic road closure flood warning system has been implemented at Lara. It alerts drivers to closures further down the road, giving them enough time to select alternative routes.

Fast-rising rivers and streams in East Gippsland present different challenges. Many of the roads and towns are remote, so putting flood warning signage in place to alert motorists to the potential dangers is generally a slow process. A local Tambo Upper resident experienced this first hand in 2016 when the region was hit by a severe flood. Across the road from the resident's house, the flood waters were rising rapidly, as were fears that, without flood warning signs, motorists risked being trapped in rising flood waters as night fell.

After that flood, local residents worked with their LGA to produce flood warning signage for the area. Residents who volunteer to be 'sign wardens', receive training to operate the signs, know

when to activate them (based on streamflow data), and how to work safely in wet conditions when activating them. The project was funded through the Natural Disaster Resilience Grants Scheme, with the Commonwealth, state and local governments funding a third each.

Community-generated projects like this show how local communities can actively manage their own flood risks, with support from agencies. Sixteen flood warning signs have been permanently erected, helping provide timely warnings to motorists about potentially unsafe conditions.




4.3 Public information and warnings for flood events

When a flood event is likely to impact a community or area, warnings are issued by VICSES, in line with established riverine or flash flood business rules. The warnings tell communities what is happening and offer the best advice on what they should do. The TFWS and the *Victorian Warning Arrangements* detail how public information on flooding is provided to communities.

Victoria has implemented the Australian Warning System (AWS) for hazards currently part of the national arrangements. The AWS for flood was implemented in Victoria in December 2021. The system uses a nationally-consistent set of icons for information and warnings during emergencies.

There are three warning levels in the AWS: Advice (yellow), Watch & Act (orange) and Emergency Warning (red). For each level, there are a series of clear action statements to guide positive action by the community. These include ‘stay informed’, ‘prepare to evacuate’ and ‘move to higher ground’.

Figure 5: The Australian Warning System for flood as employed in Victoria

Advice	Watch and Act	Emergency Warning
		
<p>An incident has started. There is no immediate danger. Stay up to date in case the situation changes.</p> <ul style="list-style-type: none"> • Stay informed • Monitor conditions • Threat is reduced 	<p>There is a heightened level of threat. Conditions are changing and you need to start taking action now to protect you and your family.</p> <ul style="list-style-type: none"> • Move to higher ground • Prepare to evacuate • Evacuate immediately 	<p>An Emergency Warning is the highest level of warning. You may be in danger and need to take action immediately. Any delay now puts your life at risk.</p> <ul style="list-style-type: none"> • Evacuate immediately • Too Late to Leave • Move to higher ground

Each warning has three components:

- **Location + Hazard** – The location and the type of hazard impacting the community.
- **Action statement** – For each warning level there are a range of action statements to guide protective action. These statements evolve as the warning levels increase in severity. Statements range from ‘stay informed’ at the Advice level, to ‘prepare to evacuate’ at the

Watch and Act level, and 'evacuate now' at the Emergency Warning level. As the situation changes and the threat is reduced, the level of warning decreases.

- **The warning level** – The severity of the natural hazard event based on the consequence to the community.

Warnings are generally issued where predictions are available. If limited or no prediction information is available, warnings will only be issued based on local knowledge and/or advice from the incident emergency management team (IEMT). If an incident crosses a border, warnings and information will take into consideration warnings being issued by the control agency of the neighbouring state.

4.3.1 Platforms and channels for warnings

The channels the community uses to source information continue to evolve with technology. To keep pace with this change, Victoria must ensure systems and processes are built on principles that guide the timely provision of information and warnings but also offer the flexibility to adapt.

VicEmergency

VicEmergency channels provide a centralised location for Victorians to access timely emergency information and warnings. VicEmergency provides this information through the VicEmergency:

- website
- app
- social media channels
- hotline.

The VicEmergency website and app provide Victorians with information and warnings about incidents including fires, storms, floods, earthquakes, tsunamis, shark sightings and more.

The VicEmergency website and app bring together data received from calls to Triple Zero (000) and emergency information from agencies and departments including:

- the Country Fire Authority (CFA)
- Fire Rescue Victoria (FRV)
- Forest Fire Management Victoria (FFM)
- Life Saving Victoria (LSV)
- VICSES
- the Department of Health
- Department of Jobs, Skills, Industry and Regions (DJSIR).

Warnings and incident information are also published for a wide range of hazards on the VicEmergency social media channels, including Facebook and Twitter.

The VicEmergency Hotline provides information during and after major incidents in Victoria. It also offers information to help householders, landowners and small businesses plan for and recover from emergencies. Victorians can access it by calling 1800 226 226. Standard hours are Monday to Friday 8am–6pm. The VICSES State Agency Commander can, in consultation with the State Response Controller (SRC), request enhanced readiness and staffing in anticipation of, or in response to, an emergency event. Operating hours can be extended and staff rostered for weekends.

The hotline has an automatic text to speech function so Victorians can access important emergency information outside operating hours, at any time of the day or night, simply by entering their postcode.

Warnings can be delivered in languages other than English or in accessible formats for people living with a disability:

- People can call the Translating and Interpreting Service on 131 450 and request translated information from the VicEmergency Hotline.
- Warnings via hearing and speech services are available by contacting the VicEmergency Hotline through the National Relay Service (NRS) –
 - Teletypewriter (TTY) users phone 1800 555 677, then ask for 1800 226 226
 - Speak and Listen users phone 1800 555 727, then ask for 1800 226 226
 - Internet relay users connect to the NRS, then ask for 1800 226 226.

While a range of VicEmergency channels have capability to support culturally and linguistically diverse communities, in-language warnings are difficult to produce in real time, given the speed of emergency events and the time required for translation. EMV maintains a strong focus on improving this access for all communities, with a pilot version of the VicEmergency app currently in development, that focuses on built in accessibility improvements and automated translations.

EmergencyAlert

Emergency Alert is a National warning system that sends a voice message to landline telephones and a text message to mobile phones to deliver critical warnings about emergencies, such as floods. This system enables authorities to provide information to communities about what action they may need to take. It is not used in all emergency circumstances – its use depends on the nature and severity of the incident.

People may receive an Emergency Alert if their billing address is in a specific location (identified by emergency services) or if their mobile phone has recently used a phone tower in the area. Emergency Alerts will not be received if there is no phone service or if a phone is turned off.

Emergency broadcasters

The Victorian Government has formal arrangements with a number of media outlets to broadcast emergency warnings and information to the community. During emergencies they provide information that enables residents to make advice-based decisions. If necessary, emergency broadcasters will interrupt normal radio or television programming to broadcast information.

Victoria has memoranda of understanding with a number of broadcasters and EMV administers Victoria's emergency broadcasting policy on behalf of emergency services. This includes 196 regional emergency radio broadcast arrangements and 12 metropolitan emergency radio broadcasters. The emergency television broadcaster across Victoria is Sky News. EMV administers Victoria's emergency broadcasting policy on behalf of the emergency services. A list of official emergency broadcasters in Victoria is available on the EMV website.⁵⁰

It's important to understand that emergency broadcasting is just one of the platforms used for warnings and information. People should always use more than one source to make sure they have the most accurate and up-to-date information possible. For example, radio reception varies and may be affected by local weather and geographical conditions.

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<https://www.emv.vic.gov.au/responsibilities/victorias-warning-system/emergency-broadcasters/list>

Case Study 1: New flood warning service for Skipton

On 10 October 2022, a new flood warning system was operationalised for the community of Skipton. The result of a collaboration between BoM, DEECA, Corangamite Shire Council, Glenelg Hopkins CMA and VICSES, completion of the new system proved extremely valuable and timely.

VICSES played a critical role in the development of the new warning service, leading a process to identify the optimum lead time for minor, moderate and major flood warnings issued by BoM. The identified impacts and consequences to the community at various flood heights were reviewed and refined to determine what actions would need to be taken by both community and agencies to protect lives and property.

Community members were kept well engaged throughout the process, and feedback was used to shape design and improvements to the system and supporting products (including a flyer outlining Total Flood Warning System changes for the community and consultation on a draft revised Local Flood Guide).

On 8 October 2022, a multi-agency/organisation community market day was held with a key focus on talking with the community about flood preparedness, warnings, impacts and response. An important stakeholder at this event was the local CFA, who have worked collaboratively with VICSES and the community for a number of years to prepare for flooding, including establishing a community sandbag collection point at their local brigade.

Within days of going live, the flood warning system was put to the test, and passed, issuing a warning to the community about impending flooding. The community were well informed and had access to timely, tailored and relevant information about what was happening. People were able to make informed decisions on how to stay safe.

5. Victoria State Emergency Service

Key points

VICSES is a volunteer-based organisation with responsibilities for the mitigation, response and recovery phases of emergency management across the state. It is the control agency for flood, storm, earthquake, tsunami and landslide events.

As control agency, VICSES had a leading role in the response to the Flood Event, supported by other state emergency management agencies, the ADF, interstate emergency services and the Victorian community.

Over 2500 volunteers from 147 of 150 VICSES Units contributed to the response, with a total of 415,000 hours provided by its members.

VICSES is funded primarily through government grants and State Budget initiatives. Its reported revenue increased by 21 per cent over the past five financial years, from \$68.9 million in 2017–18, to \$78.5 million in 2021–22.

5.1 Overview of VICSES

A volunteer-based emergency service operating 24 hours a day, 365 days a year, VICSES is managed by the Victoria State Emergency Authority and assists communities to minimise the impact of emergencies and strengthen their capacity to plan, respond and recover.

VICSES is the Control Agency for flood, storm, tsunami, earthquake and landslide emergencies. VICSES also assists other emergency service organisations (ESOs) with a dedicated workforce of volunteer and career staff. VICSES has the largest Road Crash Rescue network in Australia responding to over 1300 RCRs each year, providing coverage across 85 per cent of Victoria with highly trained volunteer crews that provide extrication and emergency life support services to the trapped or injured – and respond within benchmark timelines. VICSES' rescue capability, including Swift Water Rescue, High and Steep Angle Rescue is strategically situated across 104 Units across the State, ensuring VICSES has sufficient surge capacity across the state to respond to natural disaster emergencies and provide rescue support to Victoria Police.

This broad remit requires the VICSES Authority to maintain highly specialised services, training, vehicles and equipment to fulfil its functions for diverse emergencies requiring different specialist responses. This presents a range of resource and financial challenges and constraints for VICSES. This presents a range of resource and financial challenges for VICSES.

VICSES has, in recent years, experienced growing and more complex demands for its services due to the increasing frequency, severity and duration of natural disasters driven by climate change. The changing demands are impacting on VICSES volunteers and their ability to deliver services safely and effectively. Continued investment in VICSES is therefore vital to ensure it can meet current and future needs.

5.2 VICSES in Victoria's emergency management arrangements

VICSES is an integral part of a broad emergency management sector in Victoria. Through partnerships with communities, government, other agencies and businesses, VICSES provides timely and effective emergency management services, builds community preparedness and disaster resilience and contributes to risk reduction. The statutory functions of the VICSES Authority, set out in the *Victoria State Emergency Services Act 2005* (VICSES Act) include responding to floods and storms and their effects, and providing rescue services. VICSES also supports other agencies and organisations under collaborative emergency management arrangements created by the EM Act 2013.

VICSES collaborates and consults with EMV and performs its functions in line with standards set out in the EM Act 2013. Its role in supporting other agencies and organisations is set out in the EM Act 2013 and in the State Emergency Management Plan (SEMP).

VICSES provides key personnel for senior emergency roles such as State Response Controller and regional controllers, and deploys personnel to control centres across all tiers during emergencies. VICSES volunteers and career emergency services personnel also contribute diverse skills and experience to the multi-agency incident control centres (ICCs) across Victoria.

Flood emergency role

Flood emergencies by their nature require multiple agencies to bring together resources and communities to coordinate flood preparedness, response, relief and recovery. As the control agency for floods in Victoria, VICSES advises flood-prone communities on their local risks, and on how to prepare for and respond to floods. It performs these functions in collaboration with communities and key flood and weather specialists and services.

The SEMP details the roles and responsibilities of VICSES for flood emergency management. Governance and operating arrangements are further detailed in the SEMP Flood Sub-Plan.⁵¹

During flood events, VICSES establishes management arrangements for an integrated response to protect lives, property and the environment. It is also responsible for:

- strategic flood response planning
- providing public information and warnings, including safety advice to the community⁵²
- supporting Victoria Police with evacuations
- rescuing people trapped by collapsed structures
- protecting property from further damage, including provision and distribution of sandbags.

The VICSES Act also provides specific powers for entry into property; the removal of debris; and for constructing, removing or altering levees.

Victoria Police coordinates flood rescues with the assistance of trained personnel from VICSES, marine search and rescue volunteer organisations, the Country Fire Authority (CFA), Fire Rescue Victoria (FRV) and Life Saving Victoria (LSV).

VICSES has defined responsibilities in flood mitigation. These include:

- engaging with communities to provide flood risk information and education
- providing information to government
- assisting municipal councils to develop emergency management plans using an all-hazards risk management approach
- assisting emergency management planning committees with municipal risk assessments that consider safety and resilience through the Community Emergency Risk Assessment program
- providing advice, information, training and assistance to municipal councils and agencies on emergency management principles and practice

⁵¹ [SEMP Flood Sub-Plan | Emergency Management Victoria \(emv.vic.gov.au\)](#)

⁵² Further information about public information and warnings is provided in Chapter 4 of this submission.

- helping communities to build resilience and prevent and manage flood emergencies through targeted and general education programs.

The Community Safety Program for Flood demonstrates how VICSES collaborates with communities and partner organisations to make communities more aware and informed about their flood risks and more prepared for flood emergencies. VICSES also promotes community and household flood awareness through the Be Flood Ready program.

Further detail about the role of VICSES in fostering flood preparedness is contained in the Victorian Floodplain Management Strategy (VFMS).⁵³ The role includes the development and delivery of VICSES local flood guides, campaigns and key resources that explain local flood risks and provide tools for communities on how to prepare for and respond to floods.

VICSES has developed and delivered more than 140 local flood guides that provide tailored information to flood-prone communities across Victoria through an interactive webpage. VICSES has also led the development of 76 municipal flood emergency plans, which are sub-plans to Municipal Emergency Management Plans (MEMPs) and include critical information about local flood risks and impacts. For example, details about local sandbag arrangements and collection points are provided to encourage self-resilient communities.

VICSES supports recovery from floods by providing assistance and advice to affected individuals, families and communities. The agency also supports initial impact assessments to determine the scale and impact of a flood on people, community infrastructure and the economic, natural and built environments.

5.3 VICSES' response to the 2022 Flood Event

As noted in Chapter 2 of this submission, the response to the Flood Event involved multiple state agencies, as well as support from the ADF, interstate emergency services and the broader Victorian community.

As the control agency for storm and flood emergencies under the SEMP, and in line with its statutory functions, VICSES played a central role in the response.

The event was classified as a Class 1 Major Flood emergency under the EM Act 2013, triggering state control arrangements to ensure the effective control and coordination of response activities across multiple government agencies. Under these arrangements, the EMC appointed State Response Controllers on a rostered basis to control the emergency response including by coordinating and tasking the various agencies involved in the response.

5.3.1 Preparedness activities

In mid-September 2022, the BoM confirmed a third consecutive La Niña weather event for Australia, coinciding with a negative Indian Ocean Dipole, which meant an increased likelihood of above-average rainfall.

VICSES undertook significant preparations in the lead-up to the Flood Event, including:

- briefing the State Response Controller and regional controllers about flood and storm hazards
- a flood scenario exercise in partnership with EMV focused on readiness, response, relief and recovery – and involving the Minister for Emergency Services – on 19 September 2022.

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[Victorian Floodplain Management Strategy \(water.vic.gov.au\)](https://www.water.vic.gov.au)

- 25 regional and state briefings of emergency management personnel, in addition to the EMV-coordinated high-risk weather season program
- targeted engagement with more than 20 high flood-risk communities in the Hume and Loddon Mallee regions
- workshops on 10 August and 21 September 2022 with the NSW SES, Victoria Police and NSW Police about cross-border arrangements to ensure a consistent approach to public information and warnings between the jurisdictions, coordinated incident management, and to consider potential cross-border evacuations and relocations
- identifying 215 sandbag collection points in cooperation with local governments, and establishing arrangements for their activation
- conducting briefing sessions with Flood Analysts
- training 12 Emergency Services Telecommunications Authority (ESTA) dispatchers to operate out of ICCs, with 10 of these deployed to support the emergency response to October–November flood events
- provision of local flood guides to more than 140 locations at the start of the Flood Event.

During the peak flood period in October 2022, the VICSES website had 891,516 visits, up 1440 per cent from the previous month, with 488,397 page views of Local Flood Guides, and 35,900 of these downloaded.

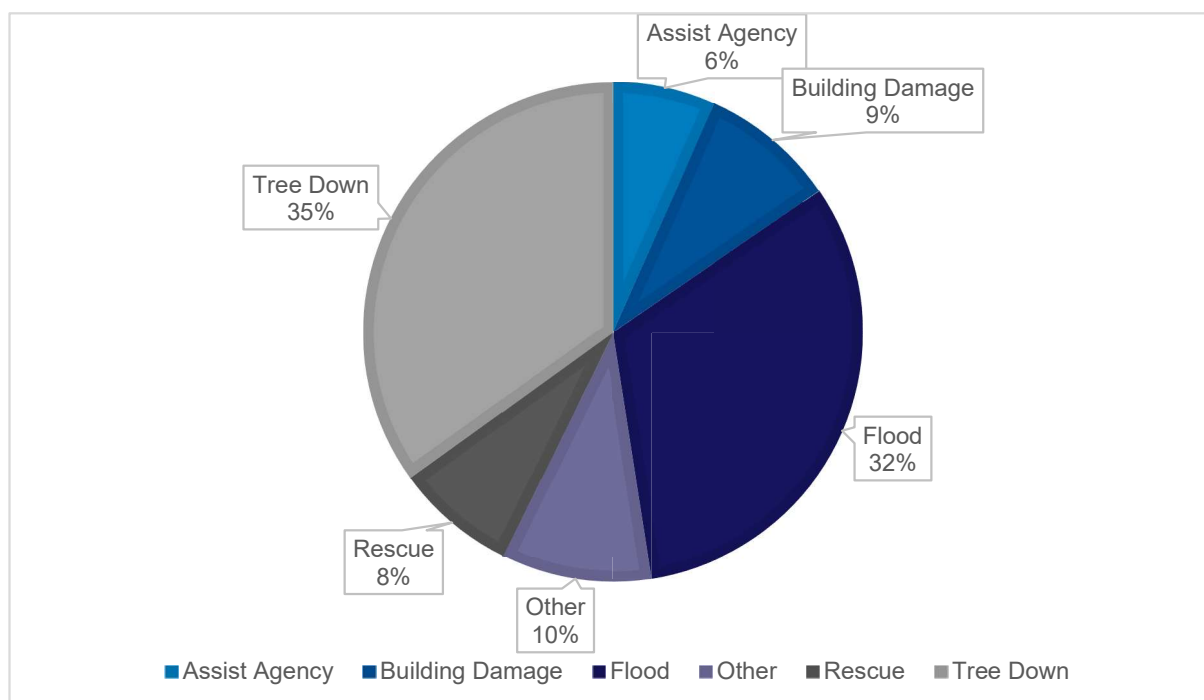
Flood guides proved to be a valuable tool for communities throughout the crisis, with 538,326 views recorded on the VICSES website between October and December 2022 – up 3462 per cent from 2021. Shepparton, Maribyrnong and Campaspe flood guides had the highest number of page views online. Flood guides were also distributed by incident management team (IMT) members through community meetings, targeted door knocks and pop-up community information stands.

Response activities

VICSES volunteers, in collaboration with sector partners, strengthened flood defences, evacuated communities and responded to thousands of requests for assistance.

Between 6 October 2022 and 3 January 2023, VICSES received 20,062 requests for assistance. VICSES attended to these requests with support from other agencies including the CFA, Forest Fire Management Victoria, Fire Rescue Victoria (FRV), Life Saving Victoria (LSV) and Victoria Police.

Figure 6: Requests for assistance by type (6 October 2022–3 January 2023).



Off the back of Victoria’s wettest recorded October, VICSES volunteers responded to a record number of requests for assistance – 13,689 – in a single month. This eclipsed the previous record of 10,740 in June 2021, and the 9674 during the floods and storms of February 2011.

Almost all VICSES staff members were deployed to control centres across the state to provide logistical and administrative support. More than 2500 volunteers from 147 VICSES units were involved in the flood response, with more than 145,000 hours collectively volunteered.

Volunteers travelled from all parts of the state to support communities impacted by the severe weather and floods. The busiest unit areas included:

- Shepparton – 980 requests for assistance (RFAs), including 402 on 16 October, and more than 180 rescues performed. 550 RFAs related to direct flood impacts, including 287 with potential for floodwaters to enter premises. 770 RFAs came from the Shepparton area alone.
- Tatura (including Mooroopna) – 546 RFAs, with 133 rescues, on 16 October.
- Ballarat – 576 RFAs, including 210 on 13 October.
- Echuca – 544 RFAs, including 320 relating to direct flood impacts and more than 30 rescues performed.
- Bendigo – 520 RFAs, including 283 on 13 October.
- Rochester – 404 RFAs, with 331 of these in the Rochester town area. More than 210 rescues on 14 and 15 October.
- Kerang – 346 RFAs, including 114 in the Kerang town area.
- Mildura – 304 RFAs over 89 days, reflecting the prolonged rise and fall of the Murray River.
- Seymour – 312 RFAs, including 150 on 13 October.
- Swan Hill – 274 RFAs, including 108 in the Swan Hill town area.

This significant response effort came just months after hundreds of VICSES members provided flood support to NSW in March and July 2022. A total of 211 VICSES members were deployed to NSW between 1 March and 8 April 2022, collectively providing 681 days of service, with 72 members deployed for a total of 284 service days between 4 and 15 July 2022.

In January 2023, immediately after Victoria's floods, VICSES members (as part of a multi-agency Victorian contingent) supported Western Australia's response to major floods in that state's north-west. Eighteen VICSES members were sent to Fitzroy Crossing and Broome to offer support.

Between 12 October and 12 December 2022, VICSES issued 4447 storm and flood-related emergency warnings to the public, with 285 of these on 14 October 2022 alone. This was the highest number of community emergency warnings issued for any single event in Victorian history. The 2022 Victorian Flood Event also marked the first time that new consistent AWS protocols were utilised for widespread flooding.

Flood rescues

VICSES participated in more than 1500 flood rescues in support of Victoria Police, the control agency for water rescue. Other partners, including LSV and FRV, also provided support, as did boat crews from the Victorian Fisheries Authority and Transport Safety Victoria.

More than 95 per cent of these rescues were undertaken by VICSES land-based swift water rescue teams and boats, demonstrating the benefits of building flood rescue skills and capacity since the 2010–2011 floods.

VICSES deployed 85 flood rescue boats during the Flood Event, along with around 20 rescue boats provided by LSV.

VICSES worked closely with Victoria Police on flood rescue coordination, including agreeing on protocols for positioning of flood rescue managers during major emergencies under the SEMP Flood Sub-Plan. Flood rescue managers were positioned in the Shepparton and Swan Hill ICCs. In addition, having the Marine Coordinator at the regional control centre (RCC) was pivotal in the overall command, control and coordination of the water rescue cell. The success of this position highlighted the importance of a multi-agency approach to water rescues.

The October 2022 floods saw the further operational development of the VICSES water rescue cell in both ICCs and the Victoria Police Rescue Coordination Centre. This became critical during mass rescues at Rochester and Shepparton-Mooroopna.

It was the first time the RCC has operated at this level, providing clear task directions for field crews across all agencies. As demand for rescues increased, it was decided to establish water rescue cells at the Shepparton ICC and subsequently at the Swan Hill ICC, each looking after defined areas, while the RCC managed the rest of Victoria.

Setting up water rescue cells within each ICC allowed greater interaction with the incident controller and operations cell to ensure an effective incident response. The addition of the Victoria Police Airwing liaison and Emergency Services Telecommunications Authority (ESTA) dispatch also assisted effective management of all water rescues and ensured responder safety. With the assistance of boat crews from the Victorian Fisheries Authority, Transport Safety Victoria and LSV the water rescue cell was able to task all boats, rescue helicopters and swift water teams for the event.

In the lead-up to the floods, VICSES led a multi-agency project to introduce a dedicated water rescue event category in ESTA's computer aided dispatch system (CAD) on 23 August 2022. This allowed for easy identification of each water rescue event, and for quick and effective triaging of more than 1500 water rescues during the Flood Event.

Swift water rescue

The *Victorian Floods Review 2011* made a series of recommendations to improve swift water rescue arrangements. From 2014, VICSES led a state-wide capability building project with Victoria Police, LSV and fire agencies which led to the development of a consistent approach to flood rescue, including swift water rescue.

Since 2014 VICSES, has trained more than 500 members in land-based swift water rescue (LBSWR), with almost 300 of these members now active in 43 units across the state. VICSES has also trained LSV's helicopter rescue crews in LBSWR. They were used for the first time during the Flood Event.

VICSES also developed a surge swift water rescue cache, which was deployed successfully during this event to bolster capability and capacity. It has been used many times by Victoria Police, including in the October 2022 floods when it was allocated to Victoria Police Search and Rescue and Water Police.

Evacuation support to Victoria Police

VICSES members are trained in supporting Victoria Police with community evacuations. During the floods, crews were often called upon, particularly in the Loddon Mallee and Hume regions.

Use of aviation

Over 89 days of flood operations, VICSES, with the support of its partner agencies, used 27 aircraft in a range of significant operational tasks. Aviation played a critical role in the response (including relief) with almost 2000 hours of flight time using a range of heavy, medium and light aircraft. Key response and relief activities included:

- aerial intelligence gathering about the extent and impact of floods (1136 hours)
- movement of IMTs and response crews into flood affected areas and isolated communities (468 hours)
- moving medical staff and hospital equipment to isolated communities
- transporting critical infrastructure equipment (including generators and telecommunications)
- delivering relief supplies, including medical supplies, to isolated communities (over 200 hours)
- delivering animal welfare via aircraft in large quantities (52 hours)
- taking large sandbags to isolated areas, including to deal with levee or dam breaches
- rescue operations when road access was limited by flooding
- first-time use in Victoria of aircraft rescue winching capacity as part of the coordinated rescue cell in the ICCs, in addition to that provided by Victoria Police and Ambulance Victoria (AV).

ADF aviation assets were also provided for limited periods to supplement state resources.

Aviation resources are managed through National Aerial Fighting Centre arrangements and are contracted by the State Government for the high-risk weather season from November to March. Under these arrangements, Victoria was able to activate call-when-needed arrangements, which allowed for some aircraft to be brought on earlier.

Sandbagging

Flood-prone communities use sandbagging to prepare for and help mitigate the impacts of floods. Sandbags can help reduce the amount of water entering homes or businesses.

Prior to the Flood Event, VICSES had developed a guide to help communities correctly fill, lay and place sandbags. More than 5000 copies of the guide were downloaded from the VICSES website during the event. VICSES had also worked closely with local governments to identify 215 sandbag collection points across Victoria, and to set up arrangements for sand supply and activating these locations, in partnership with local community groups.

VICSES used its fleet of specialist sandbag filling machines at these locations and brought in two additional machines from the Rapid Relief Team (RRT). VICSES volunteers were supported by CFA and RRT volunteers, FFMVic and local government staff, and in many instances scores of volunteers, to coordinate sandbag filling and distribution.

In total, VICSES deployed more than 1.5m sandbags to flood-affected areas during the crisis, to build temporary levees and protection around thousands of properties.

Temporary emergency works to protect life and property

Temporary emergency works can be undertaken by VICSES staff or volunteers under the VICSES Act in certain circumstances during flood events where a Service member of VICSES reasonably believes that such works is required to protect life and property. Temporary emergency works may include to construction of, removal or alteration of a levee and/or remove debris from waterways. The State Response Controller, Regional Controller, State or Regional Agency Commander, or an endorsed Level 2 or Level 3 Incident Controller is authorised to decide to undertake emergency works and direct such activities.

The Flood Event was the first widespread use of emergency works since the amendment to the VICSES Act in 2015 to provide powers for such works.

Emergency works are distinct from the engineered flood mitigation structures and associated policy framework discussed in Chapter 7 and are not intended as a primary flood mitigation strategy.

When undertaking emergency works, IMTs, including flood analysts, undertake an options analysis that involves engaging emergency management team members from CMAs, local government, Victoria Police, landowners (including Parks Victoria and DEECA in the case of public land) and, where applicable, Traditional Owner representatives.

Emergency works were undertaken at locations including Echuca, Torrumbarry, Mildura, Merbin and Yelta. VICSES is undertaking an after-action review of the application for emergency works framework for the Flood Event.

Deployment of flood analysts

Based on lessons from the 2010–11 floods, VICSES established a panel of industry flood analysts with skills in hydrology, levee and dam engineering. They were deployed and embedded within IMTs to provide advice about the extents, impacts and consequences of flood inundation.

Flood analysts are trained in incident and emergency management and the systems used by emergency services during floods, such as FloodZoom. They are also provided with coaching and support during their initial deployment, ahead of their formal accreditation as Level 2 or Level 3 flood specialists and analysts. Their role is to provide timely, accurate and actionable flood behaviour assessments to help decision makers provide informed responses and tailor community messaging to reduce risk and increase community resilience.

Flood analysts complement weather and flood forecasting services provided by BoM and Melbourne Water. Flood analysts are part of the Predictive Services Team, with a primary focus on what **could happen** next (predictive) – as distinct from other members of the intelligence cell who focus on what **has happened** (descriptive).

Observations gathered from incident controllers during the Flood Event highlighted the central importance of flood analysts in advising on likely flood behaviour and impacts. They also contributed to community engagement by providing information at community meetings.

During the 2022 Flood Event, VICSES deployed about 25 flood analysts, sourced from CMAs and private technical consulting firms, across the various ICCs, often working 24/7 shifts. Such 'surge arrangements' were needed as VICSES usually employs just one flood analyst in normal times.

Deployment of field observers

Since the 2010–2011 floods, VICSES has worked with the software provider 'Snap Send Solve' to customise its 'App for Field Observers', which provides a real-time tool for field responders and trusted community members to capture images on their mobile devices and report on emerging flood situations and consequences.

VICSES has developed a blended learning program and trained almost 900 people in its use.

During the 2022 flood response, ICCs regularly deployed field observers to gather real-time intelligence to support and improve operational decision making, and to inform public information and warnings along with road closures.

A total of 1246 Snap Send Solve reports were generated during the floods with an average of around three images per report (estimated total – 3700 images). The images are geocoded, sent and published on mapping tools within the Emergency Management Common Operating Picture (EM-COP).

Operational communications

Ahead of the most recent La Nina weather event, VICSES partnered with the Emergency Services Telecommunications Authority (ESTA) to train specialised Emergency Communication Officers to operate out of ICCs and deliver key technical capability for the sector. This proactive and collaborative level of preparedness proved to be critical during the response to the 2022 floods.

ESTA identified an opportunity to deploy specialised Emergency Communication Officers into ICCs to support ESO operational activity. This enabled ESO operations to be managed in the Computer Aided Dispatch system onsite in the ICC for the first time, which enhanced shared situational awareness and efficiency of service delivery.

Water rescue coordination centres were set up within the Bendigo, Swan Hill and Shepparton ICCs, with flood rescue managers from Victoria Police and the Emergency Communication Officers from ESTA. VICSES' new digital radios assisted cross-agency coordination to ensure effective responses to water rescues. The rescues were aided by VICSES technology that enabled connectivity with the computer-aided dispatch (CAD) system operated by ESTA. The deployment of this initiative significantly improved ESO operations and community outcomes, allowing ESTA Emergency Communication Officers to provide additional support and assistance to responding field crews, particularly in rescue efforts.

These additional resources allowed the ICC to link events that were directly reported to them, or units in the field with calls in the ESTA CAD system coming either via 132 500 or 000. The coordination of events and crews on multi-agency channels allowed for effective communication to the field. Once enabled by ESTA, the in-field Emergency Communication Officers had access to all agency events,

allowing for effective operational communication to all agencies, including Ambulance Victoria, interstate taskforces and the ADF.

The enhanced capability that the ESTA Emergency Communication Officers provided to the various ICCs was recognised by all involved. It enabled greater coordination and allocation of events specific to the flood response, ensuring greater efficiency and enhancing capacity of all emergency communications across the state. VICSES does not have a full-time staff presence in any of the ESTA communications centres. To accommodate this situation, VICSES activates the State Operations Communications Commander (SOCC) in readiness for emergency events, or when requests for assistance increase to significant level. In the October 2022 flood response, VICSES supplied a SOCC at ESTA's primary dispatch site of Williams Landing 24/7 to support timely actions and facilitate ad-hoc changes to call-taking and dispatch, improving overall response effectiveness.

Major emergencies such as the Flood Event are often accompanied by an increase in complex events that require increased collaboration and coordination. The October deployment highlighted the importance of effective multi agency partnerships and collaborative approaches to operational communications, particularly through the in field deployment of ESTA Emergency Communication Officers and the SOCC role at ESTA's dispatch site. ESTA is currently working with ESOs to advance utilisation of this capability for future deployments in incident response and major emergencies.

Cross-border coordination

In the two months preceding the Flood Event, regular engagement between VICSES and NSW SES enabled collaboration through:

- training and familiarisation with field observation platforms
- common social media tiles with clear messaging on the warnings applicable to each side of the border
- a community and stakeholder virtual meeting chaired by the Murray Darling Basin Authority, which facilitated information sharing and awareness among caravan park and tourism business operators and other landholders
- updating a formal joint Public Information and Warnings protocol for cross-border communities.

To enable and coordinate response activities, Victorian and NSW ICCs were connected by daily teleconferences from 12 October through to 12 December, with South Australian emergency services joining in from 18 November. From 12–30 December, teleconferences were held every third day.

The teleconferences sought to resolve differences in warning and media messages, coordinate response activities and coordinate community meetings.

Emergency relief operations

Amid the widespread flooding, VICSES members conducted relief operations in partnership with a range of local relief agencies and the Australian Red Cross. VICSES crews delivered medical and food supplies via high-clearance vehicles, rescue boats and aviation to isolated communities across flood-affected parts of the state. VICSES members also assisted local government relief centres at various stages of the emergency.

5.4 Organisational profile and operating model

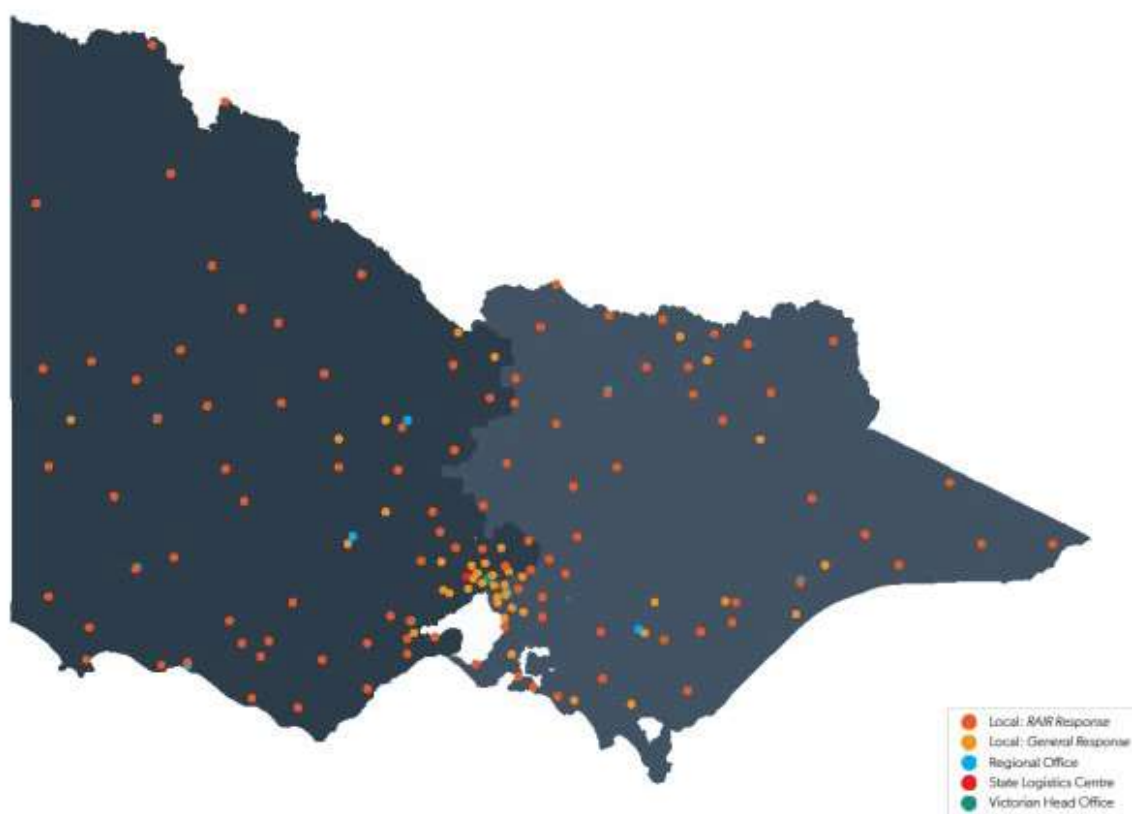
The VICSES Act establishes the VICSES Authority as a statutory authority governed by a Board of Directors. The Board is accountable to the Minister for Emergency Services.

VICSES is run by an executive management team. The CEO heads the executive management team and is responsible to the board for carrying out the authority's functions. The Chief Officer Operations directs the emergency operations activities, develops operational doctrines, oversees incident management capability development and establishes, reviews, trains and exercises VICSES units.

VICSES has 150 units across six state regions, delivering services in regional, metropolitan, rural and urban communities. It has 142 stand-alone operational units, seven regional support units and one state support unit. Its head office is in Southbank, Melbourne. VICSES also maintains a State Logistics Centre in Sunshine and permanently staffed regional offices in Mulgrave, Geelong, Warrnambool, Ballarat, Horsham, Hamilton, Bendigo, Swan Hill (Mildura), Benalla, Moe and Bairnsdale.

VICSES has over 200 employees, and more than 4000 volunteers – 60 per cent based in regional and rural areas.

Figure 7: VICSES office and volunteer unit locations



5.4.1 VICSES employees

In 2021–22, the total number of permanent paid VICSES staff was 221, compared to 203 in 2020–21. The number of permanent paid staff at VICSES has increased by 12.7 per cent since 2017–18, and by 8.9 per cent since 2020–21. Staff at each office conduct a broad range of activities, including training, finance, information services, communications, work health and safety, and people development and management. The strategically located offices provide units with access to equipment, training and other support services.

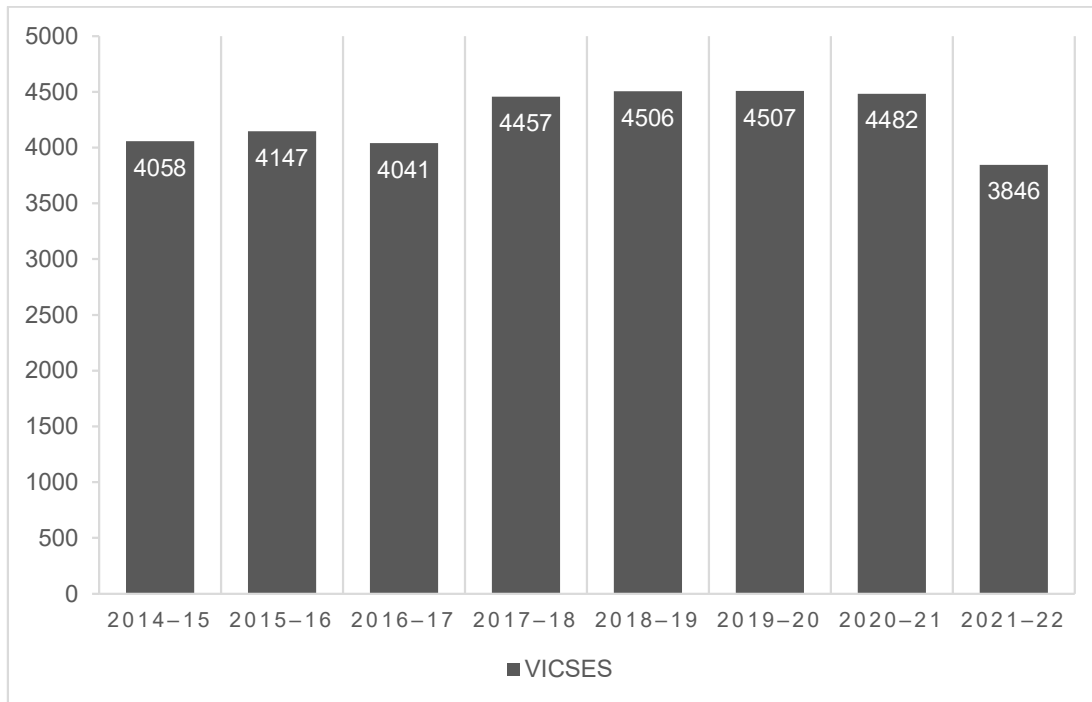
5.4.2 VICSES volunteers

The range of volunteering roles at VICSES is among the broadest in the Victorian emergency management sector. In addition to generalist roles such as flood and storm response and community engagement, several specialist roles exist to serve specific hazard-response needs; including road crash rescue, alpine rescue and swift water rescue.

Volunteers play a critical role across the emergency management sector in responding to natural disasters. However, community interest in unpaid volunteer work has been declining in recent years, with people volunteering for less time than in the past. VICSES has experienced a decrease of 14.1 per cent in the number of volunteers in the years since 2017–18.

VICSES volunteers make up 95 per cent of its workforce and serve the community 24 hours a day, 365 days a year. VICSES relies on volunteers to fill both support and operational roles to deliver its critical services, and to provide essential surge capacity for both routine and major emergencies. In 2021–22, its second busiest year on record, VICSES volunteers spent 305,636 hours responding to 39,545 requests for assistance.

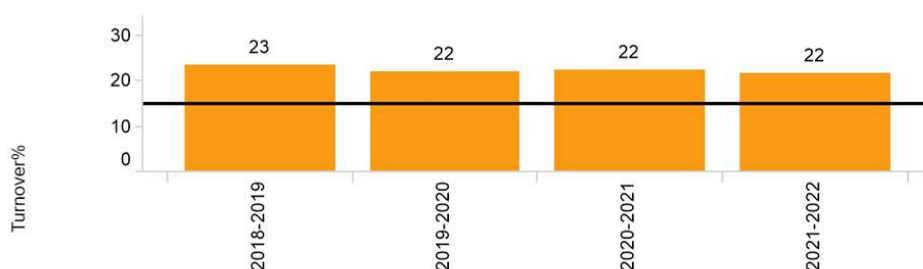
Figure 8: Number of VICSES volunteers (2014–15 to 2021–22)



The number of VICSES volunteers has decreased over recent years, reflecting both reduced capacity to convert member inquiries into operational volunteers and the challenge of keeping existing volunteers.

The average turnover rate of volunteers state-wide over the four years ending 2021–2022 was 22 per cent (see Figure 9 below). This represents a significant loss from the organisation of specialist skills and training investment that needs to be replaced. The current median service duration at VICSES is 4.22 years.

Figure 9: Turnover per cent per year (state-wide)

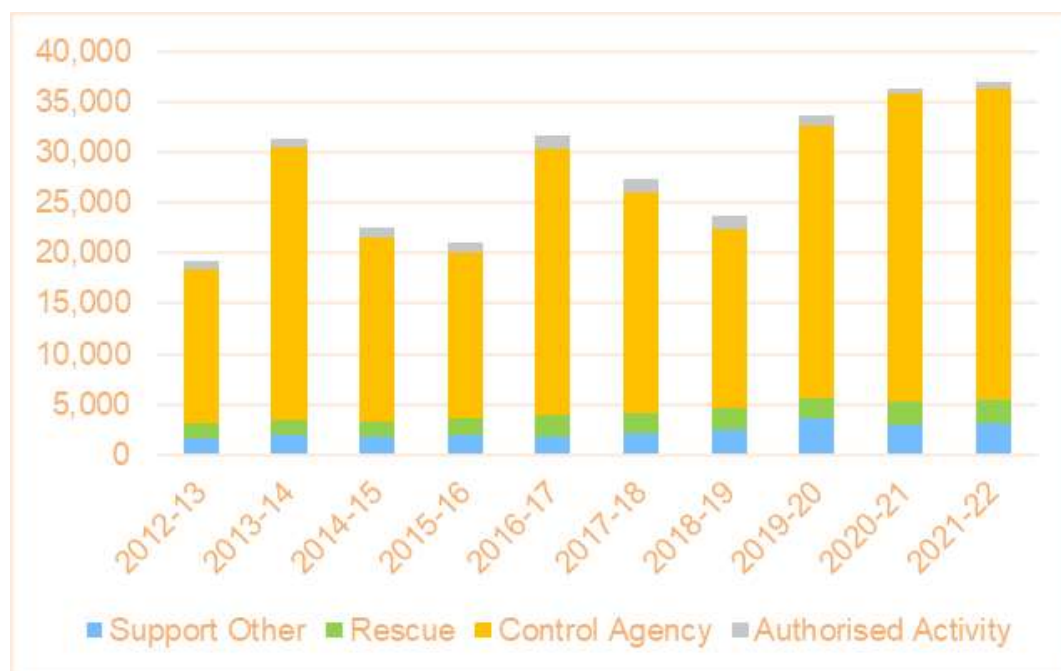


VICSES has received approximately 1350 expressions of interest from potential volunteers since June 2022. As of March 2023, VICSES has 1092 new member enquiries on its waiting list for processing.

5.4.3 Increasing demand for VICSES resources

The increasing frequency and complexity of natural disasters, along with urbanisation near disaster-prone areas and other heightened impacts of climate change, are adding to demand for VICSES services from year to year. Figure 10 below shows that the average number of incidents responded to per year increased from below 20,000 in 2012–13 to more than 37,000 in 2021–22.

Figure 10: Annual number of incident responses by VICSES



In 2021–22, VICSES responded to incidents covering all its designated hazard categories (flood, storm, tsunami, earthquake and landslide) in addition to road crash rescues. The VICSES central region recorded its busiest year on record, while the south-west region recorded its second busiest. Total hours spent by volunteers in 2021–22 for all incidents was 302,759, compared to 198,745 hours in 2012–13.

In the first three quarters of the current financial year (to the end of March 2023) VICSES responded to 28,312 incidents. October 2022 was the busiest month on record, with 13,886 requests for assistance amid the major flood emergency across the state.

5.4.4 Funding

VICSES relies on income (predominantly State Government grants via the Department of Justice and Community Safety) to fulfil its essential role in the state's emergency sector. VICSES also receives gifts, donations, project grants and sponsorship from the community and private sector.

Other funding sources include Victorian Government Volunteer Emergency Services Equipment Program (VESEP) grants that require matched co-contributions from volunteer units.

VICSES also receives money from the Transport Accident Commission – apportioned to cover VICSES' road rescue obligations – and through sponsorship arrangements with key partners for its community safety programs and awareness campaigns. Current partnership agreements exist with DEECA and Melbourne Water.

In 2021–22, VICSES reported revenue of \$78.5 million. In previous years, funding has included investment in VICSES facility infrastructure projects and additional funding for emergency management reforms, which does not reflect ongoing base funding.

Revenue for VICSES in 2021–22 was primarily driven by State Government grants and appropriations, continuing a five-year trend. Other revenue included subscriptions and benefit funds received from the community, donations, industry contributions and fundraising. See Appendix 1 for a breakdown of VICSES' revenue from 2017–18 to 2021–22.

VICSES costs have steadily increased over the past five years, from \$61 million in 2017–18 to \$73.8 million in 2021–22. Details of VICSES' expenses from 2017–18 to 2021–22 are provided in Appendix 2.

VICSES facilities

On 20 December 2017, a Memorandum of Understanding (MoU) was signed between the Victorian Government, VICSES and the Municipal Association of Victoria (MAV) which resulted in VICSES assuming responsibility for operational and maintenance funding of VICSES Volunteers units (including Volunteers unit facility maintenance) from historical council arrangements.

In return under this arrangement, where able, councils will facilitate long-term leases for VICSES units in exchange for minimal or nominal rent on land owned or managed by local councils, ensuring security of tenure for VICSES units as a high priority. Where this is not possible, leases of private land will continue to be required. The Victorian Government provides initiative funding to maintain volunteer facilities or pay commercial rents to fund the operational cost, maintenance and renewal of facilities of volunteer units.

Since 2017-18, the Victorian Government has made significant investment in VICSES facility infrastructure projects. The availability of modern, fit-for-purpose facilities supports units to provide their important services to communities and helps to sustain and encourage volunteers in their role protecting the community. The delivery of 19 new and upgraded facilities across Victoria to support the critical work of VICSES units is being managed by the Community Safety Building Authority (CSBA), within DJCS. A table of these infrastructure projects is included at (see Appendix 3).

VICSES fleet and equipment

VICSES assets play an essential role in delivering emergency services to the community, government and other emergency service organisations. State-wide there are five specialist command vehicles, 10 storm support trailers, 83 rescue boats and nine heavy rescue trucks. An

additional 21 heavy rescue trucks were funded through the 2022 – 23 budget. Each of the 143 operating units has one vehicle funded through general appropriation. These provisions resulted from the VICSES Output Price Review in 2007–2008, which led to funding of \$4 million for vehicles and an additional \$800,000 for running costs.

The rest of the VICSES fleet (65 per cent) is provided by units and supported by local fundraising by volunteers. This is supplemented by grant programs such as the Volunteer Emergency Services Equipment Program (VESEP), which provides \$2 for every \$1 a local volunteer unit raises, to a maximum of \$150,000.

VICSES has invested in the Critical Asset Program (CAP) which supports state-funded replacement of trucks and other fleet assets, such as operational support vehicles, lighting plants, specialist trailers and boats. These are necessary in delivering specialised services relating to road rescue, storm, flood, landslide, swift water, search and rescue (land and water, steep angle including alpine in winter), crime scene support and fire and ambulance support. Since 2018–19, \$25.34 million has been allocated to CAP.

6. The Victorian Floodplain Management Strategy

Key points

The *Victorian Floodplain Management Strategy (2016)* sets the direction for floodplain management in Victoria.

It aligns with the Victorian Government's responses to the *Victorian Floods Review (2011)*, the *Parliamentary Inquiry into Flood Mitigation Infrastructure (2012)* and the broader emergency management framework set out in the *Emergency Management Act 2013*.

The strategy was released in April 2016 and, in the seven years since its release, has allowed for a deliberative response to floodplain management and government investment.

6.1 The deliberative response to the Victorian Floods Review

In response to the Victorian Floods Review and the Parliamentary Inquiry into Flood Mitigation Infrastructure in Victoria, the Victorian Government set up an Interdepartmental Stakeholder Reference Group, headed by an independent Chair, to develop the Victorian Floodplain Management Strategy.

The reference group had representatives from:

- local government authorities (LGAs)
- catchment management authorities (CMAs)
- water corporations
- VICSES
- Bureau of Meteorology (BoM)
- the Municipal Association of Victoria
- Emergency Management Victoria (EMV)

Departmental staff from the predecessor of the Department of Energy, Environment and Climate Action (DEECA) with expertise in floodplain management, planning and governance were also involved. Subject-matter experts were on hand to provide advice and support.

A draft Victorian Floodplain Management Strategy was released on 26 June 2014, through Engage Victoria. It sought community feedback on ways to improve the Strategy. Twelve information sessions were held across Victoria to hear people's views and 76 written submissions were received.

LGAs provided more submissions than any other group of stakeholders, followed by state and regional river, land and coastal managers, and members of the public. Traditional Owner groups, CMAs, water corporations, the insurance industry, other industries, professional associations, special interest groups and emergency services also contributed in this way.

The range of responses meant feedback was received on most aspects of the Strategy, with some key themes repeated across multiple submissions. Importantly, the feedback identified gaps in the scope of the draft and highlighted the need to seek further stakeholder input on the revised proposed policies, actions, and accountabilities.

The revised draft Victorian Floodplain Management Strategy was released on 13 June 2015 for an eight-week consultation period. Written submissions were invited from the wider community and individuals and organisations who made submissions on the first draft were contacted directly for feedback. Nine targeted roundtable workshops were held across the state with key stakeholders. Five more were held with individual organisations at their request.

The Revised Draft received 58 written submissions, again from a range of interest groups. They included:

- Traditional Owner groups – 2 per cent
- water authorities – 5 per cent
- industry – 7 per cent
- community members – 9 per cent
- professional associations and special interest groups – 10 per cent
- river, land, and coastal management agencies – 14 per cent
- LGAs – 53 per cent.

The second round of consultations indicated growing support for the direction being taken. This feedback informed the April release of the *Victorian Floodplain Management Strategy (2016)*.⁵⁴

6.2 Overview of the Victorian Floodplain Management Strategy

The Victorian Floodplain Management Strategy (VFMS) sets the direction, and clarifies roles and responsibilities, for floodplain management in Victoria. It builds on the technical basis of the *Victoria Flood Management Strategy 1998*.

The VFMS aligns with the Victorian Government's responses to the *Victorian Floods Review (2011)*, the *Parliamentary Inquiry into Flood Mitigation Infrastructure (2012)* and the broader emergency management framework set out in the *Emergency Management Act 2013*.

The VFMS aims to ensure that Victorian communities, businesses and government agencies are aware of flood, and actively take measures to manage their flood risks. This can help minimise consequences to life, property, community wellbeing and the economy.

6.2.1 Funding

In July 2016, the Victorian Government allocated \$21 million to implement the VFMS over four years. This included the establishment of nine Regional Floodplain Management Strategies (RFMSs).

Another \$26.7 million was allocated in July 2021 to complete remaining actions. Part of this funding was spent implementing priorities identified by regional communities in their RFMSs.

Funded projects included:

- flood studies
- flood mitigation infrastructure
- early warning systems for local communities
- FloodZoom – a flood intelligence platform to support emergency management.

6.2.2 Implementation progress

All 56 actions in the VFMS are either completed or embedded in business-as-usual (BAU) practice. The Strategy will continue to inform decisions and actions for managing flood-related issues over

⁵⁴

<https://www.water.vic.gov.au/managing-floodplains/new-victorian-floodplain-management-strategy>

its ten year term, from 2016. A snapshot of progress against the actions has been publicly released, with the latest update being released in 2022.⁵⁵

Sound strategy within the VFMS at state level and within each region's RFMS, as well as flood studies to understand local risk, underpins the state's investment in warning systems and other mitigation infrastructure. Significant investment in design and engagement with local communities to address their priorities has meant many key projects were shovel ready when Commonwealth funding became available.

Victoria recently secured:

- \$1.2 million – Carisbrook levee, 2020–21
- \$2.2 million – Castlemaine levee, 2020–21
- \$3.5 million – Wangaratta levee, 2020–21
- \$2.38 million – Numurkah levee, 2021–22
- \$1.06 million – Seaspray levee, 2021–22.

6.3 Transparency of roles, responsibilities and accountabilities

Flood management depends on highly coordinated cooperation between many different organisations. It calls for an all 'all hazards, all agencies' approach. Within this context, it is important to ensure that **one single agency is accountable for each individual step** in the coordinated process.

The VFMS distinguishes between responsibilities and accountabilities to ensure transparency:

- 'responsibility' is about ownership of an endeavour
- 'accountability' is about being answerable for the outcome of those efforts.

The VFMS assigns specific accountabilities in 12 of its 26 chapters. It also outlines the roles and responsibilities of various agencies, including DEECA, LGAs, Melbourne Water, CMAs and VICSES.

RFMSs set out how the delivery of locally prioritised actions will be shared and who will do what in a particular region.

6.4 Flood intelligence

Flood studies are completed by hydrologists and flood mapping experts and are designed to help communities understand and manage their risk. They consider historic and future floods and often take up to three years to deliver. Sophisticated computer models must be built to mirror local conditions, and extensive rounds of engagement with local communities and emergency responders are needed, to incorporate local knowledge. Anecdotal and historical empirical information about flood extents, flood depths, and flood velocities for different sized floods is built into the models so they are considered credible by local communities.

- In rural Victoria, flood studies are a priority in regional floodplain management strategies. They are typically undertaken by local councils with technical assistance from CMAs and VICSES.
- In the Port Phillip and Westernport regions—

⁵⁵

See the latest snapshot of progress against the VFMS at <https://www.water.vic.gov.au/managing-floodplains/new-victorian-floodplain-management-strategy>

- studies in larger catchments are usually managed by Melbourne Water and LGAs
- studies in smaller catchments are usually led by LGAs.

Policy 11a of the VFMS says that, unless there are compelling reasons to the contrary, all new flood studies must have the following outputs:

- draft Planning Scheme Amendments
- preferred elements for a Total Flood Warning System
- preferred options for flood mitigation measures
- drafts of the relevant components of the Municipal Flood Emergency Plan.

DEECA is accountable for maintaining and continually improving Victoria’s web-based flood intelligence platform, FloodZoom.

FloodZoom stores all flood study data – currently over 200 sets of results – and DEECA must add any new ones as soon as they are completed. The Victorian Government has funded 66 flood studies since the VFMS was released in 2016. DEECA will invest in another 30 flood studies across Victoria over the next five years.

FloodZoom is not a public platform. It is a specialist tool built for trained flood analysts and hydrologists. It brings together:

- flood related behaviour information such as recent and historic modelling of the extent of floods, depths, flood levels, study reports and observed flood impacts
- real time and historical rain and streamflow records
- flood forecasts, flood mapping and property data, such as floor heights.

DEECA has a critical obligation to ensure that FloodZoom is available and fit-for-purpose for assisting emergency responses 24 hours a day, seven days a week:

- FloodZoom’s planning system module is used by regional CMAs as a dedicated BAU planning tool, to assess and streamline land use planning applications in locations subject to flood inundation. This helps ensure that FloodZoom contains current and accurate data and remains the single point of truth for riverine flood information in Victoria, ready to support flood readiness and flood response.
- FloodZoom also hosts several BAU modules regularly used by flood analysts. This means they are comfortable on the platform and poised to provide flood-specialist services during floods. During a flood, FloodZoom incorporates current flood spatial data, live rainfall data and live stream level data. Its advanced search and data validation functions enable a flood analyst to provide advice to incident management teams (IMTs) and inform the way VICSES issues warnings, manages evacuations and prepares response strategies.

Regular use and updating of FloodZoom helps DEECA and the CMAs meet their accountabilities around flood intelligence.

6.5 Managing dams in times of flood

Victoria’s water corporations are responsible for managing Victoria’s major water storages. They must also manage the weirs and regulators along Victoria’s regulated river systems.

The Murray-Darling Basin Authority is responsible for storages and structures on the Murray River and also manages the Dartmouth dam system.

Victoria's major storages were designed and built to provide water supply and irrigation services, not to mitigate floods. Any flood mitigation from a dam is incidental and opportunistic and depends on its water level at the time of flood-inducing rain. Any regulating gates are in place solely to keep the dam safe and maximise water storage, while fixed spillways keep large dams at safe operating levels and allow floodwaters to pass.

Despite this, during small to medium flood events, some Victorian dams have been operated in ways that absorb some flood water. The capacity for storages to mitigate flooding depends on several factors including the size of the flood, the volume of water already in the storage, infrastructure available at the site and the reliability of weather forecasts.

- **Bulk entitlements:** The intent of Victoria's major storages – providing water supply and irrigation services – is reflected in the water sharing framework. A bulk entitlement, granted under the *Victorian Water Act 1989*, is a legal right to take and use water. There are rules about when, where and how much water can be taken and who has access to it. Bulk entitlements codify what storage managers can and cannot do and provide certainty about how storages will operate. Bulk entitlements can specify target-filling curves which aim to manage the rate of filling during the higher inflow periods of winter and spring while still maximising water security once demands start for the season.
- **Dam safety:** In some cases, when inflows are high and major storages are approaching 100 per cent capacity, storage managers can use controlled pre-releases to ensure dam safety and minimise potential flooding impacts, while aiming to return storages to full supply level when the risk has passed.
- **Infrastructure constraints:** The ability to control the release of water from a full dam depends on its design.
 - When dams with fixed crest or tilt gate spillways fill, the water will flow over the spillway. The peak flow rate depends on how high the storage level reaches. The peak outflow will always be lower than the peak inflow.
 - Gated dams offer some potential to hold water back, but limits arise from the dam's design, inflow volumes and, crucially, safety considerations.
 - The ability for water pre-release is also limited by a dam's design and the associated infrastructure.
- **Consideration of downstream impacts:** When water is to be pre-released, the ideal target is for downstream flows to stay below minor flood levels. This minimises downstream impacts but can also constrain the usefulness of a pre-release.

The management arrangements for large flow releases from dams are set out in the SEMP Flood Sub-Plan.⁵⁶

6.6 Regional floodplain management strategies

Melbourne Water and the nine CMAs are accountable for developing and periodically reviewing their RFMSs in partnership with LGAs, VICSES, water corporations, other partner agencies and local communities.

The main role of an RFMS is to help agencies with flood emergency management functions align their potential to source and allocate funds towards locally prioritised actions over a three-year

rolling implementation plan. DEECA has developed guidelines for their preparation. The methods align with the principles of the *National Emergency Risk Assessment Guidelines*.⁵⁷

Each RFMS is based on an assessment of a region's flood risks. The community considers their tolerance for these risks. A range of mitigation measures for intolerable risks are explored. In practice, this involves comparing measured flood risks against the level of risk assumed in the Total Flood Warning System for the locality. If the level of risk assumed in the warning system is lower than the actual risk, then the Total Flood Warning System must be upgraded to reflect this.

Regional strategies prioritise the actions necessary to put preferred mitigation measures in place and assign a lead agency responsible for delivering each action. Measures that do most to narrow the difference between existing flood risks and the community's willingness to accept those risks are at the top of the list. Mitigation measures might include strategic plans for land use and for flood warning and response arrangements.

7. Engineered flood mitigation structures

Key points

The *Victorian Floodplain Management Strategy* sets out cost sharing arrangements for designing and constructing flood mitigation infrastructure and clear principles to guide future investment in large-scale flood mitigation infrastructure.

Over the last 100 years, approximately 4,000 km of levees have been constructed across Victoria. The majority of these levees were built without any design standards, typically in anticipation of, or during, flood events. Their structural integrity cannot be relied upon.

Flood mitigation infrastructure outside Melbourne Water's region not currently under formal management will remain that way unless the relevant LGA decides this should change

Part 7A of the *Emergency Management Act 2013* and the Victorian Critical Infrastructure Resilience Strategy outline measures that owners and operators of critical infrastructure covered by the Act should take to manage emergency risks that will affect service delivery.

7.1 Key issues identified by the Parliamentary *Inquiry into Flood Mitigation Infrastructure in Victoria after the 2010–11 floods*

In 2012, Parliament's Environment and Natural Resources Committee reported on key issues faced in the 2011–12 floods. The *Inquiry into Flood Mitigation Infrastructure in Victoria* found:

- There was considerable uncertainty about ownership and maintenance responsibilities for many of Victoria's levees.
- Three key issues were central to the discussion of who owns and who should maintain a levee when responsibilities are unclear –
 1. land tenure
 2. who benefits from the levee
 3. who did the construction work.
- The 'beneficiary pays' principle was viewed as the most appropriate way to determine ownership, management and maintenance responsibilities.
- A common state-wide approach to prioritising investment in levees was clearly required, underpinned by the beneficiary pays principle.
- Work was needed to clarify liability issues around levees. Public authorities should be protected for work done on priority levees in good faith and in circumstances where they are acting reasonably and responsibly in the public interest.
- There were over 400 dams owned and operated by water corporations across the state; most fixed crest spillway dams – not designed for significant flood mitigation.

7.2 Policies and accountabilities of the Victorian Floodplain Management Strategy to resolve those issues

7.2.1 Background

Over the last 100 years, approximately 4,000 km of levees have been constructed across Victoria. Most were built without design standards – typically in anticipation of, or during, flood events – and

their structural integrity cannot be relied upon. A small number are built to a high standard, aiming to protect local communities. These levees are formally managed, typically by LGAs.

The floods of 2010–11 were preceded by the long years of the Millennium Drought, 1996–2010. During this period there was significant institutional change. For example, the restructure of local government began in 1994 with the dissolution of 210 councils. By 1996 they had been replaced with elections held for 78 Local Government Areas (LGAs).⁵⁸ In 1997, Victoria's catchment management authorities (CMAs) also came into being.

LGAs and CMAs have overlapping roles and responsibilities for drainage and floodplain management, and the 2010–11 floods revealed confusion about how best to harmonise these. A key function of the Victorian Floodplain Management Strategy (VFMS) was to establish unambiguous management arrangements for engineered flood mitigation structures and clarify roles and responsibilities for agencies like these.

7.2.2 Cost sharing arrangements for new engineered flood mitigation structures

The Parliamentary Inquiry's emphasis on the 'beneficiary pays' principle is reflected in the VFMS.

In recognition of the high capital costs associated with designing and constructing flood mitigation infrastructure, the VFMS sets out cost sharing arrangements. If new large-scale flood mitigation infrastructure meets government investment criteria (see 7.2.3) costs can be shared equally between the Australian and Victorian Governments and relevant LGAs.

The 'beneficiary pays' principle is applied more fully to the maintenance and management of new flood mitigation infrastructure. Formal arrangements, agreed to prior to construction, ensure that this is funded by beneficiaries, through the relevant LGA.

New, large-scale rural flood mitigation infrastructure can only attract government funding if it satisfies the investment criteria outlined in the VFMS.

7.2.3 Investment criteria for new flood mitigation infrastructure:

The Victorian Government is guided by the following principles when deciding whether or not to invest in large-scale flood mitigation infrastructure:

- Due process – Communities will be consulted so their concerns, their local knowledge and their ideas about flood mitigation options can be considered.
- Due diligence – Decision-making processes will set clear objectives, be evidence-based and examine all reasonable options to mitigate flood risks.
- Cost effectiveness – The three tiers of government will only invest in building or upgrading flood mitigation infrastructure if the benefits are greater than the total costs (including capital and ongoing costs).
- Supporting analysis – This will include consideration of the economic value of flood mitigation infrastructure to local economies, including local industries and businesses.
- Community benefits – The three tiers of government will only invest in building or upgrading flood mitigation infrastructure where the primary benefits are the protection of:
 - human life and safety
 - community safety, by ensuring major evacuation routes are maintained

⁵⁸ The total number of LGAs was later increased to 79.

- community welfare, by ensuring the continuity of social services, particularly those provided by public infrastructure
- existing dwellings, where it is only feasible to protect them through collective action.
- Accountability for ongoing management – The three tiers of government will only invest in building or upgrading flood mitigation infrastructure if the accountability arrangements for ongoing management, maintenance and assurance are agreed and clearly documented. These arrangements should allow for measurable outcomes to be established, evaluated, and reported.

In practice, it is easier to demonstrate a *prima facie* case for these community benefits for urban areas. Hence, the three tiers of government, working together, will only continue to fund flood studies and cost-effective mitigation measures for urban areas. Large-scale rural flood mitigation infrastructure is no longer considered best practice for rural areas.

7.2.4 Levees constructed or modified under these cost sharing arrangements

The 2020–21 budget initiative *Building Flood Resilience in Victoria* allocated \$26.7 million over four years to prepare for and mitigate the consequences of future floods.

Regional floodplain management strategies document flood mitigation measures that regional communities identify as doing the most to reduce their flood risks to a locally acceptable level. State agencies and local government authorities use these to guide available funding toward priority projects.

The Risk Resilience Grants program is the primary avenue for project managers to access federal and state government funding for flood projects. It is co-funded by the Victorian Government as part of the National Partnership Agreement on Disaster Risk Reduction 2019–2024. A combination of federal and state government funding can make up two thirds of project costs, but the balancing third must come from the LGA through a combination of cash and in-kind contributions.

Major levee construction projects are generally beyond the capacity of the Risk Resilience Grants Program, but funds can be used to advance consultation, conduct feasibility assessments, develop preliminary designs and estimate construction costs. By investing in the preparatory phases of priority flood mitigation projects, Victoria is well positioned with shovel-ready projects, to take advantage of co-funding construction opportunities when they arise. Section 6.2.2 (above) lists some of the levee projects Victoria has recently received federal funding for. These include \$2.4 million towards construction of the Northern Numurkah flood levee and an upgrade of Seaspray’s levees through the Black Summer Bushfire Recovery Grants Program (\$1.1 million).

7.2.5 Further levees under active consideration

Flood studies under regional floodplain management plans have identified the potential for approximately \$115 million to be invested in a further nine levees; two in Bendigo and the other seven in Charlton, Violet Town, Wodonga, Numurkah, Seymour, Rochester and Maryborough.

The deliberative, community-based, decision-making processes involved in deciding whether or not to proceed with these levees takes time, and it is possible that not all these proposals will proceed – even if funding is available. It is important to note that community perceptions about the desirability of engineered structures change depending on how long it has been since their area experienced flood. For example, Seymour and Rochester decided against proceeding with engineered structures in 2020 (see text box below), but there is potential for renewed community interest following the Flood Event in October 2022.

Case Study 2: Community deliberations about engineered flood mitigation structures in Seymour

The people of Seymour have been deliberating about levees and other engineered flood mitigation structures for many years.

- Between 2011 and 2013, the Victorian Government made funding available to design a levee, and obtain the land required for its construction, on the Goulburn River.
- In 2018, at the request of the community, funding was provided to investigate Whiteheads Creek's contribution to Seymour's flood risk and to consider potential mitigation options.
- In 2019 Mitchell Shire Council invited the community to give their feedback on the proposed Goulburn River levee.
- On 29 June 2020, Council resolved not to proceed, based on their assessment of risks associated with levee maintenance and 'overwhelmingly negative' community sentiment – this included losing access to the river, aesthetic issues, the levee being 'unnecessarily large' and concerns that Whiteheads Creek flooding was not adequately addressed.

Community debate about the importance of Whiteheads Creek led council to undertake a stand-alone assessment of its contribution to flooding and the options for mitigation.

The *Whiteheads Creek Mitigation Report (2020)* discussed several flood mitigation options, including works in and around Whiteheads Creek. The three most feasible options were upgrades to:

- the channel
- the Goulburn Valley Highway culverts
- the Oak and Wimble Street pipes and railway culverts.

Indicative costs for each option was high and the benefits low, with all upgrades having a limited impact on flood depths. Only the Oak/Wimble Street pipe works showed a potential decrease – just one per cent lower flood levels in the area. There was no clear preference for any upgrade.

Construction costs for the proposed Seymour levee, including land acquisition, is estimated at approximately \$10 million. There is potential for renewed community interest following the Flood Event of October 2022.

7.2.6 Flood mitigation in the Port Phillip and Westernport regions

Melbourne Water is responsible for engineered flood mitigation structures in the Port Phillip and Westernport regions. The flood management strategy focuses on identifying high-priority areas and, by working with local communities, exploring and implementing flood mitigation options. Melbourne Water then develops and delivers infrastructure maintenance programs according to agreed levels of service.

The Melbourne Urban Stormwater Institutional Arrangements project will clarify roles and responsibilities for stormwater management, including maintenance.⁵⁹ The Melbourne Urban Stormwater Institutional Arrangements project will clarify roles and responsibilities for stormwater

management, including maintenance. It is also exploring innovations around place-based solutions to be adopted in the future.

7.2.7 Management arrangements for unmanaged levees

Policies in the VFMS state that any flood mitigation infrastructure outside Melbourne Water's region not currently under formal management will remain that way unless the relevant LGA decides this should change. A Regional Floodplain Management Strategy or local assessment can help determine that formal management arrangements are required.

Where flood mitigation infrastructure is not being formally managed:

- the relevant municipal planning scheme must not assume the infrastructure will provide flood protection
- the municipal flood emergency plan must have provisions in case there is a sudden and complete failure of that infrastructure.

DEECA has developed guidelines for bringing existing structures into formal management arrangements. Under this process, the costs of restoring or upgrading the flood mitigation infrastructure to bring it into formal management arrangements will, if it meets the government investment criteria, be shared equally between the Australian and Victorian Governments and the relevant LGAs. The beneficiaries of the levee, through their LGA, will pay the ongoing costs of management and maintenance.

Levees on Crown land that are not being formally managed can weather away unless those benefiting decide to repair and maintain them. It is possible for a person to apply to the Minister for a permit to maintain a levee on certain Crown land. These permits may be subject to conditions specified by both the Crown land manager and Minister for Water (or a delegate, like a CMA). Applicants must ensure their activities comply with all approvals, including Aboriginal cultural heritage requirements.

7.2.8 Other engineering structures with potential flood impacts

Infrastructure on a floodplain can alter the movement of floodwater or cause it to be retained on the floodplain longer than it otherwise would. All new infrastructure must therefore be designed to minimise or avoid these risks. CMAs and Melbourne Water provide advice on all major infrastructure projects, including road and rail ones, regarding their potential to cause changes to the movement and retention of water on floodplains and the options to mitigate those impacts and achieve beneficial outcomes.

Flood studies also identify existing structures that may be adding to risks in some communities. Options for mitigating those risks are assessed.

Some infrastructure is critical to the health, safety and prosperity of the Victorian community. 'Critical infrastructure' is specifically defined for the purposes of Part 7A of the EM Act 2013. Not all managers of dams, roads and other critical assets are subject to the Act's requirements.

Part 7A of the Act, and the *Victorian Critical Infrastructure Resilience Strategy*, outline measures that persons the Governor in Council designates by Order as being responsible for critical infrastructure covered by the Act should take to manage emergency risks that will affect service delivery. Persons responsible for vital critical infrastructure, as it is defined within the Act, are tasked with developing and implementing site-specific strategies to mitigate and manage the effects of risks (including risks from natural hazards such as flooding) to ensure continuity of essential services.

Government departments also have responsibilities in assisting and monitoring the performance of vital critical infrastructure.

Under action 19a of the VFMS, DEECA in consultation with the CMAs, Melbourne Water, and representative asset owners, has developed principles for managing serious risks to critical infrastructure from waterway processes. Those principles accord with the principles and obligations outlined in the *Victorian Critical Infrastructure Resilience Strategy* and relevant legislation.

8. Flood Event as a whole and affected catchments and floodplains

Key points

Chapter 8 provides data and spatial information on the Flood Event and affected catchments, floodplains and communities along the Avoca, Barwon, Broken, Campaspe, Goulburn, Loddon, Maribyrnong and Murray rivers. For significantly impacted areas, detailed narratives are included.

8.1 Overview

In October 2022, a low-pressure system travelled east over Australia, bringing heavy rainfall and storms. Already high rivers, creeks, and sodden catchments had little capacity to absorb the rain, leading to one of the most damaging flooding events in Victoria's history.

The 2022 Flood Event caused devastation across much of Victoria and affected thousands of people. Two Victorians tragically lost their lives. Hundreds of homes and buildings across the state were inundated, displacing residents and closing businesses. It isolated people and communities, damaged their homes, disrupted essential services, disrupted and disconnected their social supports and systems, and impacted mental health, wellbeing, personal property, businesses, and livelihoods.

From 13–14 October 2022 parts of Victoria experienced rainfall totals between 150–300 mm, including the highest falls of:

- 222 mm in Strathbogie North
- 210 mm at Charnwood
- 166 mm on the Goulburn River at Seymour.

With some sites in central and north-eastern Victoria receiving more than 150 mm over the 48 hours ending at 09:00 on 14 October 2022, and others experiencing their wettest two consecutive days on record, major to record flooding occurred on many rivers. This led to road closures, and inundation of many homes, properties and large areas of farmland.

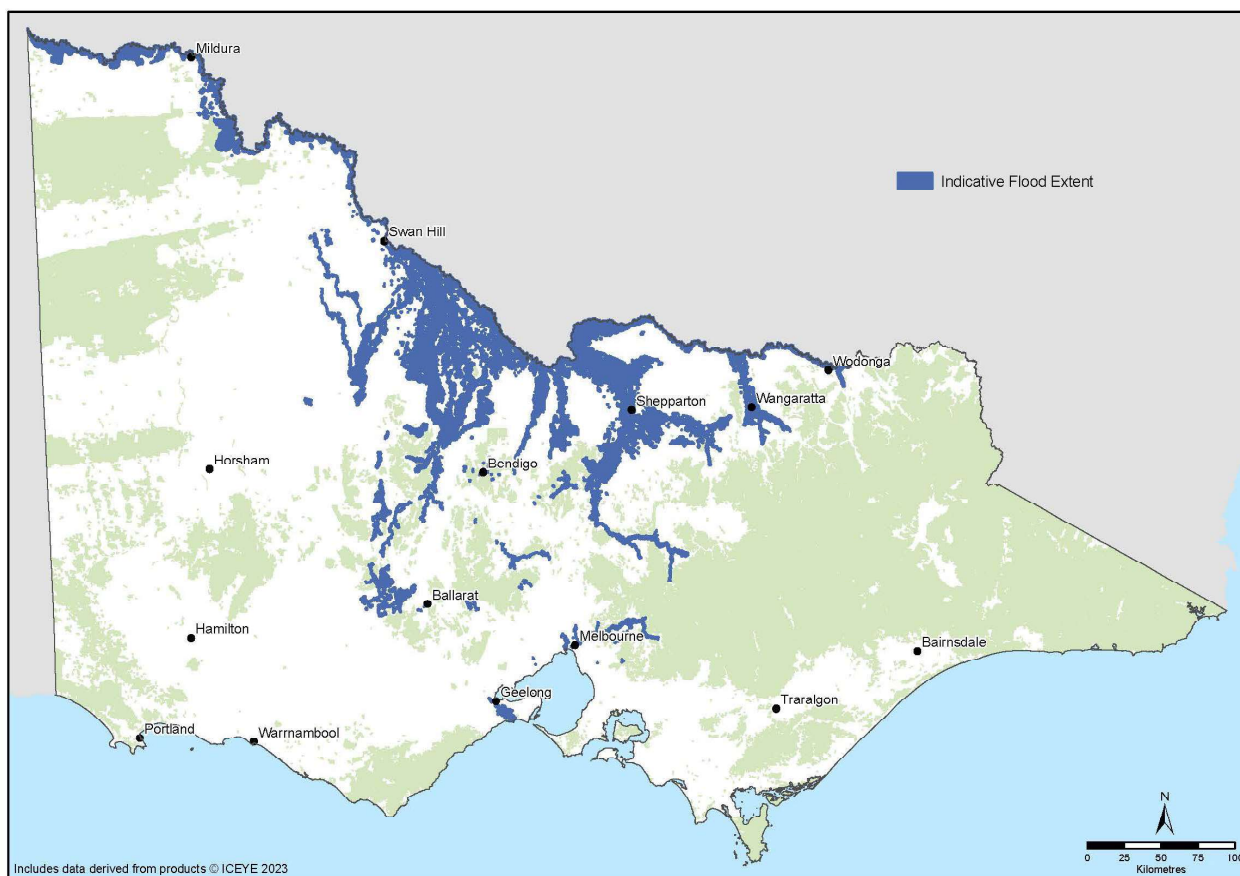
The initial rain event was followed by several smaller, storm driven, heavy rain events that caused localised flash flooding and kept river levels high.

On 14 October 2022, the town of Rochester, on the banks of the Campaspe River, and Seymour on the Goulburn River, were inundated with flood peaks higher than those recorded in 2011 and 1974, respectively.

Over the remainder of October and November, rain continued to fall and major flooding continued across much of the state. The Goulburn, Murray, Campaspe, Loddon, Avoca, King, Kiewa, Barwon and Maribyrnong rivers were among those that flooded. Evacuations took place in Melbourne suburbs near the Maribyrnong River and in northern Victorian communities along the Campaspe, Goulburn and Murray rivers; including the towns of Shepparton, Rochester and Echuca. Communities experienced flooding of homes, businesses, infrastructure, roads and crops.

Agriculture Victoria estimates that approximately 12,230 agricultural properties were impacted by flooding across northern Victoria. The flooding damaged 1545 residential and commercial buildings, leaving 976 buildings uninhabitable.

Figure 11: Indicative observed flood extent

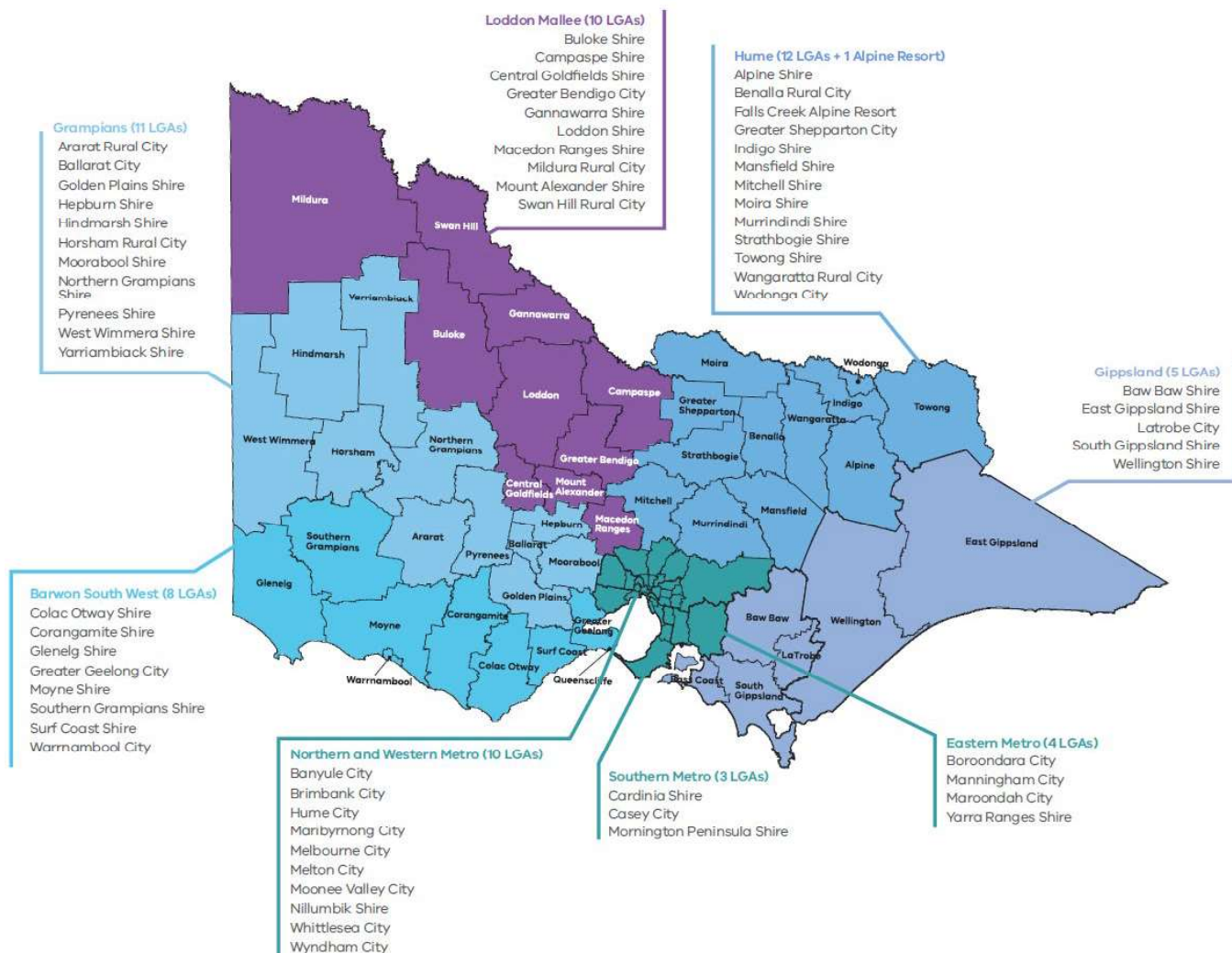


In the Hume region, the townships of Shepparton, Mooropna and Murchison (Greater Shepparton Local Government Area, LGA), Seymour (Mitchell LGA) and Benalla (Benalla LGA) saw major flooding and inundated properties. Barmah (Moirra LGA) and Wodonga (Wodonga LGA) were also impacted.

In the Loddon Mallee region, the townships of Rochester and Echuca (Campaspe LGA), Kerang (Gannawarra LGA), Bridgewater on Loddon (Loddon LGA), Baringhup and Campbells Creek (Mount Alexander LGA), Heathcote (Greater Bendigo LGA) and Mildura (Mildura LGA) all suffered moderate to major flooding and inundation of properties.

In the north west metro region, Maribyrnong (Maribyrnong LGA) saw major flooding and inundation. Across Victoria, 63 LGAs and one alpine resort were affected (see Figure 12).

Figure 12: Flood impacted LGAs



Floodwaters continued to move through the river systems well into December. Standing water remained, and many other townships across the state saw minor to major flooding, impacting residential and commercial properties.

Each flood event is different and river levels and movement of water across the landscape is captured as part of an event. The SCC, ICC, CMA and Water Corporations take the opportunity to capture a broad range of data from events including aerial imagery, depth, extent, flow rates, broader catchment behaviour, to ground truth models and to inform future decision making for community and asset management.

8.2 Specific affected catchments, floodplains and river systems

The Flood Event affected large parts of Victoria. The sections below provide information on catchments, floodplains and river systems specifically listed in the Terms of Reference.

8.2.1 Avoca River

The Avoca River runs west of the Loddon River, rising south of the Pyrenees Ranges and flowing 270 km north to end at Lake Bael Bael between Kerang and Swan Hill. The river has a basin size

of 12,352 km² and its main tributaries are the Glenlogie, Sugarloaf, Cherry Tree and Strathfillan creeks, which all flow in from the west to Charlton. Downstream of Charlton, the Avoca River splits into several channels including Tyrell Creek, which terminates at Lake Tyrell at Sea Lake, and Lalbert Creek which terminates at Lake Lalbert. In times of high flow, its waters empty into the Avoca Marshes and can even reach the Murray River via Lake Boga.

The key townships at risk of flooding from the Avoca River include Avoca, Natte, Yallock, Charlton, Quambatook, Wycheproof and Culgoa. Prior to the Flood Event, the BoM produced flood outlook scenarios on 11 October 2022 which were shared with VICSES and other emergency agencies to enable them to prepare. These scenarios indicated that moderate flooding between 5.9 metres and 6.1 metres was possible at Charlton.

On 12 October 2022 BoM updated the flood outlook scenarios. The higher possible scenario for Charlton increased to 6.7 metres, which was below the major flood level of 7.5 m. BoM issued their first flood warning for Charlton at 23:59 on Thursday 13 October 2022. This warning was for moderate flooding and noted that, 'The Avoca River at Charlton Township is likely to exceed the moderate flood level (5.9 m) overnight Thursday into Friday. Further rises are likely with forecast rainfall.'

At 10:00 on Friday 14 October 2022 a public meeting was held in Charlton to advise residents of the potential flood risk. The information provided was that the community should prepare for a flood event similar in magnitude to the September 2010 flood event and expect the river level in Charlton township to rise to 7.9 metres.

At 13:00 on Saturday 15 October 2022 the river level at the Charlton township gauge reached the major flood level of 7.5 m. In total, a further 13 flood warnings were issued by BoM for Charlton before the observed flood peak of 7.87 m at 14:45 on Monday 17 October 2022.

A series of on-ground actions were undertaken by the local Council working in conjunction with emergency services and the local community. These works reduced the consequences of flooding to the Charlton community by directing floodwaters away from the town.

The flood levels at Charlton dropped to below minor flood level on 16:00 on Thursday 20 October 2022.

BoM issued their first flood warning for Quambatook at 23:59 on Thursday 13 October 2022. This warning was for minor flooding and noted that, 'The Avoca River at Quambatook is expected to exceed the minor flood level (2.00 m) late Thursday afternoon. Further rises are likely as upstream peaks arrive.'

On 16 October 2022 a public meeting was held in Quambatook to advise residents of the predicted flood peak of 2.4 m.

In total 16 flood warnings were issued by BoM for Quambatook before the observed flood peak of 2.36 m at 15:45 on 21 October 2022.

Flood waters filled the Avoca Marshes and joined with flood waters from the Loddon floodplain that flowed through the Kerang wetlands before entering Lake Boga.

Floodwater from the Avoca River spill into Tyrell Creek. Mallee CMA held a community pop up session in Culgoa on 18 October 2022 to engage with residents on flood predictions and preparedness.

Case Study 3: Charlton flood mitigation and preparedness activities

The Avoca River at Charlton experienced its largest flood in January 2011 with a recorded peak flood height of around 8.7 m at the James Paterson Bridge. Since then, Victoria State Emergency Service (VICSES), the North Central Catchment Management Authority, Buloke Shire and the Bureau of Meteorology (BoM), in collaboration with Charlton residents, have enhanced the flood warning system through:

- Charlton Local Flood Guide – updated in August 2019
- Buloke Shire Municipal Flood Emergency Plan – updated in June 2019
- improvements to flood warning gauges –
 - telemetered gauge installed at James Patterson Bridge in Charlton
 - Yarwong Weir gauge housing relocated to higher ground with a higher antenna installed
 - new river gauge installed at Wimmera Highway Bridge at Logan.

In September 2022, VICSES and North Central Catchment Management Authority (NCCMA) officers conducted flood preparedness site visits to high-risk communities, including Charlton. These visits contributed to further understanding of the flood risks.

At a community forum in Charlton on 26 September 2022, VICSES, NCCMA, Council, and officers from other emergency services organisations updated residents on flood preparations, which included:

- removal of the culvert along the Charlton–St Arnaud Road and a low-level floodway reinstated
- upgrade of the local transfer station to include a flood protection levee and essential infrastructure raised
- comprehensive flood mapping (Flood-Eye) specifically for the Charlton area which allowed users to download a tailored flood report for an individual property⁶⁰
- communications strategies that involved consultation with local residents in key areas to inform emergency management authorities
- confirming town meeting points
- strategies to engage and inform vulnerable community members to assist in early preparation
- sandbag collection points.

8.2.2 Barwon River

The Barwon River has its source in the Otway Ranges and flows 160 km to meet the sea at Barwon Heads, flowing into the Bass Strait. The river basin size is 8590 km² with several tributaries including Boundary, Atkin, Birregurra, Warrambine Sandy, Matthews, Deans Marsh, Brickmakers, Retreat and Scrubby creeks, and the Leigh and Moorabool rivers.

The Barwon flows through a number of towns and settlements including Forrest, Barwon Downs, Birregurra, Winchelsea, Inverleigh, Ocean Grove, Barwon Heads, and the major population centre of Geelong.

⁶⁰

Available on the NCCMA website at <https://www.nccma.vic.gov.au/flood-eye>

The Barwon River recorded its largest flood in November 1995 with an estimated peak level of 5.94 m at Geelong. The flood scenarios for the Barwon River catchment indicated possible moderate peak levels but less severe than the record November 1995 floods.

BoM issued their first flood warning for Geelong at 17:27 on Thursday 13 October 2022. The warning was for moderate flooding and noted that, 'The Barwon River at Geelong is likely to exceed the minor flood level (2.3 m) Friday afternoon. The river level may reach the moderate flood level (3.1 m) Saturday morning.'

A further eight flood warnings were issued by BoM before the observed flood peak at Geelong on 15 and 16 October 2022, at 3.85 m, and again on 15-16 November 2022, at 3.84 m (moderate flooding).

Between 1 October 2022 and 3 January 2023, the Barwon River at Geelong remained at minor or below minor flood levels.

VICSES, Corangamite CMA, Golden Plain Shire, City of Greater Geelong in collaboration with the communities in the Barwon Catchments, to update local flood guides for Inverleigh, Shelford, Batesford and Geelong, and Municipal Flood Emergency Plans for Golden Plain Shire and City of Greater Geelong.

8.2.3 Broken River

Broken River rises in the Wellington–Tolmie highlands and flows north-west to Benalla and then west, ending at the Goulburn River near Shepparton. Its 225 km flow forms part of the Murray–Darling Basin. The main tributaries of the Broken River are Hollands, Ryans and Lima East creeks⁶¹, with its main storage at Lake Nillahcootie.

Benalla has a history of flooding that has impacted people, homes, businesses, farms, and livestock since European settlement in the late 1800s, well before official flood records began. Since then, major flooding has affected the area in 1870, 1916, 1917, 1918, 1921, 1924, 1933, 1954, 1966, 1974, 1975, 1981, 1993 and 2010. The 'Big Flood of 1993' caused significant damage to homes and businesses as well as important community buildings and infrastructure. The flood scenarios for the Broken River catchment indicated possible moderate peak levels but less severe than the record October 1993 floods.

BoM issued its first flood warning for Benalla at 07:36 on Thursday 13 October 2022. The warning was for minor flooding and noted that, 'The Broken River at Benalla is likely to reach the minor flood level (2.5 m) Sunday afternoon. Further rises are possible.'

A further five flood warnings were issued by BoM before the observed flood peak at Benalla on Friday 14 October 2022 at 10:14, reaching 4.49 m (marginally below the major flood class level of 4.50 m).

The flows dropped to below minor flood level at 07:00 Sunday 16 October 2022.

Flows along the Broken River were significant to initiate flows into a number of breakway channels north of the Broken River, including Broken Creek, O'Keefe Creek, Pine Lodge Creek, Daintons Creek and Congupna Creek.

⁶¹ Broken River and Upper Broken Creek. Victorian Environmental Waterholder, <https://www.vewh.vic.gov.au/rivers-and-wetlands/northern-region/upper-broken-creek>

Flooding in the Broken River also contributed to the impact on Shepparton and Mooroopna downstream because it flows into the Goulburn River. At Orrvale, southeast of Shepparton, the river peaked in major flood between 16–17 October, reaching 8.32m on 17 October 2022.

VICSES in collaboration with the Goulburn Broken CMA and Benalla Rural City conducted a flood awareness community meeting in Benalla on 29 September 2022. This meeting was attended by around 90 residents and was streamed live. The attendees were informed about the flood warning system and preventative actions to protect their property and wellbeing.

8.2.4 Campaspe River

The Campaspe River begins near Trentham in Victoria's central highlands and flows 232 km in a generally northerly direction towards Echuca, where it meets the Murray River. Its 4,179 km² basin forms part of the larger Murray-Darling Basin. Kyneton, Redesdale, Elmore, Rochester and Echuca are among the main towns along the Campaspe.

The main tributaries are the Coliban River, and Mclvor and Wild Duck creeks above Lake Eppalock and Mount Pleasant, and Forest and Axe creeks below Lake Eppalock.⁶²

The flood scenarios for the Campaspe River catchment forecast possible major flood peak levels, of similar severity to the record January 2011 floods.

Prior to October 2022, the Campaspe River experienced its largest flood in January 2011 with a recorded peak flood height of around 115.4 metres AHD in Rochester.

Key areas of impact during the 2022 floods were in and around Rochester and Echuca. Flooding in Echuca occurred first from the Campaspe River and then from Murray River. The flooding in Echuca is discussed in 8.2.8.

Rochester

Prior to the flood event on 11 October 2022, BoM produced flood outlook scenarios indicated that major flooding between 114.9 metres AHD and 115.3 metres AHD was possible at Rochester.

On 12 October 2022 BoM updated the flood outlook scenarios and indicated that major flooding between 115.2 metres AHD to 115.5 metres AHD was possible at Rochester.

BoM issued their first flood warning for Rochester at 18:53 on Wednesday 12 October 2022. The warning was for major flooding and noted that, 'The Campaspe River at Rochester Town is expected to exceed the minor flood level (113 m AHD) overnight Thursday into Friday. The river level is likely to exceed the moderate flood level (114 m AHD) Friday morning and is likely to reach the major flood level (114.5 m AHD) Friday afternoon.' The complementary VicEmergency 'Watch and Act – Avoid the flooded area' was issued by VICSES at 20:07 on Wednesday 12 October 2022. Both the warning and notification were issued around 54 hours before the flood peak.

Another 10 flood warnings were issued by BoM, and a further eight notifications by VicEmergency, before the observed flood peak.

The VicEmergency notification remained at 'Watch and Act – Avoid Flooded area' at 08:55 on Thursday 13 October 2022. The notification was then updated to 'Move to Higher Ground' at 13:15. At 17:15 on Thursday 13 October 2022 an 'Emergency Warning – Evacuate Immediately' was issued for Rochester following a BoM-issued warning that the flood level at Rochester was 'likely to reach around 115.5 m AHD overnight Friday into Saturday' with 'further rises' possible. The emergency warning was updated at 19:05 and again at 22:37. This Emergency Warning was

issued around 26 hours before the observed flood peak and followed by a second at 18:18pm Friday 14 October 2022.

The Emergency Alert campaign for Rochester began at 17:17 on Thursday 13 October 2022 with the following message:

Any person located in Rochester or the surrounding area should EVACUATE NOW. Flooding to the township of Rochester is expected tonight, between 250 and 450 properties will be directly impacted by flooding. Relief centres to be situated at Echuca United Football Netball Club, 252 High Street Echuca. EVACUATE NOW.

It was successfully delivered to 1183 landlines and 6058 mobiles.

The flows at Rochester dropped to below minor flood level on 1639 on Tuesday 18 October 2022.

A virtual desktop exercise was conducted on 21 September 2022 and attended by VICSES, Victoria Police, the Country Fire Authority (CFA), NCCMA, BoM, Campaspe Shire Council and Echuca Moama Search and Rescue. Discussions included:

- overview of the situation and predictions (BoM/NCCMA/VICSES)
- VICSES spring preparedness update
- Shire readiness and response overview
- incident management arrangements
- critical infrastructure
- sandbags (storage, collection points and sand procurement)
- community engagement plan.

Due to the possible severity of the flood, VICSES engaged with the Rochester community on Wednesday 12 October 2022 at a community meeting, and through targeted doorknocking of possible affected properties (approximately 700) beginning on Thursday 13 October. This was around 60 hours (2.5 days) before the peak. The doorknocking was guided by the available flood intelligence from the Campaspe Municipal Flood Emergency Plan, updated in February 2019.

Detailed flood scenarios and flood intelligence were not available for the January 2011 flood, however, subsequent installation of an automatic flood level gauge in the Rochester township, and its use in the October 2022 flood warnings, reduced the confusion that occurred in 2011. This is an example of how collaborative effort between communities and agencies can improve flood warning systems and community safety.

Case Study 4: Rochester flood mitigation and preparedness activities

Since the January 2011 flood, collaboration between VICSES, NCCMA, Campaspe Shire, BoM and Rochester residents has enhanced the flood warning system through:

- Rochester Local flood Guide – updated in September 2020
- Campaspe Shire Municipal Flood Emergency Plan – updated in February 2019
- improvements to flood warning gauges: telemetered gauge installed at Bridge Road in Rochester.

A virtual desktop exercise was conducted on 21 September 2022 and attended by VICSES, Victoria Police, the Country Fire Authority (CFA), NCCMA, BoM, Campaspe Shire Council and Echuca Moama Search and Rescue. Discussions included:

- overview of the situation and predictions
- VICSES spring preparedness update
- Shire readiness and response overview
- incident management arrangements
- critical infrastructure
- sandbags (storage, collection points and sand procurement)
- community engagement plan.

Echuca

Flooding in Echuca occurred first from the Campaspe River and then from Murray River. The flooding of the Murray River is discussed in 8.2.8.

The Campaspe River at Echuca peaked at around 96.25 m AHD late on Sunday 16 October 2022, exceeding the January 2011 flood level. A temporary levee, 2–3 km long, was built along the Murray River to bolster protection around the township.

Echuca was hit by two flood peaks, with the first through the Goulburn–Broken River system and the second as the flow moved through the Murray River from floodwaters upstream.

8.2.5 Goulburn River

The Goulburn River is the largest river basin in Victoria, covering 7.1 per cent of the state or 1.6 million hectares, and flowing 570 km from the Great Dividing Range to the Murray River, east of Echuca.⁶³

Towns and localities impacted by the Flood Event included Shepparton, Nagambie, Murchison, Seymour, Mooroopna, Kialla and Kialla West, Euroa, Bunbartha and Echuca.

Following heavy rainfall during the week of 13 October 2022, significant flooding occurred across the Strathbogie, Murrindindi, Mitchell and Greater Shepparton and Moira LGAs. This impacted many people, homes and businesses, and resulted in significant damage to roads and bridges, making access and egress more difficult.

⁶³

Goulburn River, Victorian Environmental Waterholder, <https://www.vewh.vic.gov.au/rivers-and-wetlands/northern-region/goulburn-river>

The Goulburn River at Seymour reached major flood levels between 13–15 October 2022, peaking at 8.26 m at 02:45 on Friday 14 October, well above the record levels of May 1974 (7.64 m). Major flood levels continued between 15–18 October at Murchison, peaking at 12.07 m on 15 October and impacting low-lying communities along the Goulburn. Major flooding was also experienced throughout Shepparton between 16–19 October 2022, with a peak of 12.06 m at 21:08 on Sunday 16 October 2022, which impacted properties in Mooroopna and Kialla as well.

Seven Creek at Euroa peaked at 5.6 m on 14 October 2022, just below the 5.67 m recorded in October 1993, while flooding at Kialla West peaked at 7.2 m overnight on Saturday 15 October 2022. This was higher than the September 2010 peak of 6.65 m, recorded at the site of the creek's convergence with the Goulburn River.

Seymour

Flood scenarios issued by the BoM on 11-13 October 2022 indicated that moderate flooding was possible at Seymour.

The BoM issued their first flood warning for Seymour at 00:09 Thursday 13 October 2022. This warning was a moderate flood warning and noted that “The Goulburn River at Seymour is likely to exceed the minor flood level (3.80 m) early Thursday morning. The river level may reach the moderate flood level (5.20 m) Thursday evening. Further rises are possible with forecast rainfall.” The VicEmergency ‘Watch and Act – Prepare now’ alert was issued by VICSES at 02:35 on Thursday 13 October 2022. The warning and notification were issued around 24 hours before the flood peak in Seymour.

A further six flood warnings were issued by the BoM before the observed flood peak at Seymour. These warnings were accompanied by a further seven VicEmergency notifications issued by VICSES before the flood peak.

The Vic-Emergency notification escalated to ‘Watch and Act- Move to higher ground’ at 14:15 on Thursday 13 October 2022. The ‘Emergency Warning – Evacuate Immediately’ alert was issued at 19:18 Thursday 13 October 2022, following on from the Bureau issued warning that the flood level at Seymour was “likely to reach around 8.20 metres overnight Thursday into Friday”. This Emergency Warning approximately six hours before the observed flood peak. A second ‘Emergency Warning – Evacuate Immediately’ notification was issued at 23:09 on Thursday 13 October 2022.

The Goulburn River at Seymour reached major flood levels between 13–15 October 2022, peaking at 8.26 m at 02:45 on Friday 14 October 2022, well above the record levels of May 1974 (7.64 m)

Floodwaters from tributaries downstream of Lake Eildon, including the Acheron River, Rubicon River, Home Creek, Yea River, King Parrot Creek, Sugarloaf Creek and Hughes Creek, were the primary contribution to the peak level at Seymour. The peak level at Seymour (8.26 m at 02:45 on Friday 14 October 2022) occurred prior to the additional releases from Lake Eildon arriving at Seymour. Lake Eildon releases were increasing as flood levels at Seymour peaked and flows from the downstream tributaries were decreasing. This resulted in the peak levels experienced at Seymour falling before the releases from Lake Eildon arrived. Inflows to Lake Eildon peaked at 145,000 ML/day while releases were able to be maintained at a peak flow of 38,000 ML/day. This shows the significance of the flows from unregulated tributaries downstream of Eildon on peak flood levels at Seymour.

The flood levels at Seymour dropped to below minor flood level at 14:00 on 23 November 2022.

A community meeting in Seymour on 18 October 2022. This meeting was attended by around 90 residents and was streamed live. The attendees were informed about relief and recovery activities.

The Emergency Alert campaign for Seymour began at 21.36 on Thursday 13 October with the following message:

EVACUATE NOW for FLOODING at Seymour from the Victoria State Emergency Service. If you are located in the area bounded by the Goulburn River to Redbank Rd; along the Goulburn Valley Hwy to Whiteheads Creek up to the railway line and along the bridge crossing the river to the south, and low-lying areas around the Goulburn Valley Hwy/Redbank Rd area, it is recommended you Evacuate Immediately. A Relief centre is open at Seymour Sports and Aquatic Centre, Chittick Park. EVACUATE NOW to high ground NOW. Follow SES advice. Listen to radio. More info www.emergency.vic.gov.au.

The Emergency Alert was successfully delivered to 1014 landlines and 7953 mobiles.

Shepparton, Mooroopna, Kialla and Murchison

Flood scenarios issued by BoM on 11-13 October 2022 indicated that moderate to major flooding was possible at Shepparton.

BoM issued their first flood warning for Shepparton at 12:11 on Thursday 13 October 2022. The warning was for minor flooding and noted that, 'The Goulburn River at Shepparton is likely to exceed the minor flood level (9.5 m) Friday afternoon. Further rises are possible from upstream floodwaters.' The complementary Vic-Emergency 'Advice – Stay informed' was issued by VICSES at 13:53 on Thursday 13 October 2022. The warning and notification were issued around 80 hours before the flood peak.

A further 16 flood warnings were issued by BoM before the observed flood peak at Shepparton–Mooroopna. These warnings were accompanied by a further 27 VicEmergency notifications issued by VICSES, also before the flood peak.

The VicEmergency notification was escalated to 'Watch and Act – Avoid flooded area' at 07:19 on Friday 14 October 2022, and then to 'Watch and Act – Prepare to Evacuate' at 9.42pm on the same day. A further notification, 'Emergency Warning – Evacuate Immediately', was issued at 02:01 on Saturday 15 October 2022 following the BoM-issued warning that the flood level at Shepparton was 'expected to exceed the moderate flood level (10.7 m) Saturday afternoon ... the major flood level (11 m) overnight Saturday into Sunday and may reach around 12 m during Tuesday, slightly below the 1974 flood event level of 12.09 m.'

This warning was delivered around 29 hours before the observed flood peak. A further 'Emergency Warning – Evacuate Immediately' notification was issued at 20:03 on Saturday 15 October 2022.

On Friday 14 October 2022, community meeting was held in Shepparton. More than 10,000 individuals accessed the Goulburn Broken Community Flood Intelligence Portal to obtain flood information specific for their properties in 24 hours following this community meeting. A total of 21,400 individuals accessed the portal for the month of October.

The flood levels at Shepparton dropped to below minor flood level at 09:00 27 November 2022.

Major flood levels occurred between 15–18 October at Murchison, peaking at 12.07 m on 15 October 2022 and impacting low-lying communities along the Goulburn.

Sevens Creek at Euroa peaked at 5.6 m on 14 October 2022, just below the 5.67 m recorded in October 1993, while flooding at Kialla West peaked at 7.2 m overnight on Saturday 15 October 2022. This was higher than the September 2010 peak of 6.65 m, recorded at the site of the creek's convergence with the Goulburn River.

VICSES in collaboration with the Goulburn Broken CMA and Greater Shepparton City Council conducted a flood awareness community meeting in Shepparton on 1 October 2022. This meeting

was attended by around 40 residents and was streamed live. The attendees were informed about the flood warning system and preventative actions to protect their property and wellbeing.

8.2.6 Loddon River

The Loddon River flows from the Great Dividing Range in the south to the Murray River in the north. At 392 km, it is the second longest river in Victoria, rising in the Central Highlands of Victoria between Daylesford and Woodend, joining the Little Murray River north of Kerang, and then the Murray River at Swan Hill. Its 15,320 km² basin forms part of the larger Murray–Darling Basin.

Tullaroop Creek is the main tributary in the upper Loddon River. The middle section is characterised by many distributary streams and anabranches that carry water away from the river onto the floodplain, while the lower Loddon River is joined by Pyramid Creek at Kerang, at which point it becomes part of the Murray River floodplain.

Towns along the river include Newstead, Bridgewater, Serpentine and Kerang. The Loddon River catchment is managed by the North Central CMA.

The flood scenarios for the Loddon River catchment forecast possible major flood peak levels of less severity than the record January 2011 floods.

The Loddon River experienced its largest flood in August 1909 and January 2011. Both floods were of a similar magnitude, the peak flood flow from Laanecoorie Reservoir was approximately 195,000 ML/day (9.4 m).

Downstream Laanecoorie

Flood scenarios issued by BoM on 11-13 October 2022 indicated that moderate to major flooding was possible downstream of Laanecoorie Reservoir.

The Loddon River downstream Laanecoorie experienced major flooding on 14-15 October 2022, peaking at 8.40 m at 09:45 Friday 14 October 2022. Kerang also experienced major flooding between 22–25 October, with the Loddon peaking at 77.97 m AHD at 11:00 on Saturday 22 October 2022.

BoM issued their first flood warning for Downstream Laanecoorie at 17:27 on Wednesday 12 October 2022. The warning was for moderate flooding and noted that, 'The Loddon River D/S Laanecoorie is likely to reach the moderate flood level (3 m) Thursday morning.'

A further six flood warnings were issued by BoM before the observed flood peak.

The flows dropped to below minor flood level at Laanecoorie on 27 November 2022.

Key areas of impact during the 2022 floods from the Loddon River were in an around Newstead, Newbridge, Bridgewater, Serpentine, and Pyramid Hill,

Doorknocking of identified at risk properties in Bridgewater was undertaken by VICSES in the early morning on Friday 14 October 2022. There was insufficient time to arrange a public meeting to engage with the broader community. Flood waters peaked in Bridgewater at 18:15 on Friday 14 October 2022.

VICSES in collaboration with the Victoria Police conducted a flood awareness community meeting at Barringhup Caravan Park on 26 September 2022. This meeting was attended by park operators and residents. The attendees were informed about the flood warning system and preventative actions to protect their property and wellbeing.

VICSES in collaboration with the North Central CMA, Mount Alexandra Shire conducted a flood awareness community meeting in Newstead on 28 September 2022. This meeting was attended by

residents and local CFA brigade. The attendees were informed about the flood warning system, levee management arrangements and preventative actions to protect their property and wellbeing.

Kerang

BoM issued their first flood warning for the rainfall event of 12-14 October 2022 for Kerang at 02:14 on Friday 21 October 2022. The warning was for minor flooding and noted that, 'Stream rises are commencing from earlier rainfall at the Loddon River at MV Hwy Bridge (Kerang), and the river may reach the minor flood level (77 m) over the weekend. River rises will continue into next week as upstream water arrives.'

A further 25 flood warnings were issued by BoM before the Loddon reached its observed flood peak (77.9 AHD) at the Murray Valley High Bridge in Kerang on 22 October 2022. The river remained in major flood between 22–25 October 2022.

On 16 October 2022 a public meeting was held in Kerang to advise residents of the potential flood risk.

On 24 October 2022 a local flood observer arranged a community meeting at the Benjeroop Hall with key messaging confirmed with the Incident Control Centre.

On 24 October 2022 rural levees in the Benjeroop / Murrabit West area began to breach.

On 1 November 2022 strategic breaches were undertaken by emergency services in five locations in the Benjeroop / Murrabit / Fish Point area to allow flood water on the floodplain that had originated from upstream breaches on the Loddon system to flow into the Murray and Little Murray Rivers.

The flows dropped to below minor flood level in Kerang on 12 November 2022.

VICSES in collaboration with the NCCMA and Gannawarra Shire conducted a flood awareness community meeting for local flood observer network in Kerang on 28 September 2022. This meeting was attended by residents and landholders across the lower Loddon floodplain. The attendees were informed about the flood warning system, levee management arrangements and preventative actions to protect their property and wellbeing.

8.2.7 Maribyrnong River

The Maribyrnong River begins on the slopes of Mount Macedon and is the second major river in metropolitan Melbourne.⁶⁴ The catchment is located to the north-west of Melbourne and the main tributaries are Jacksons and Deep creeks. These two creeks join at Keilor North to form the Maribyrnong River, which flows to join the Yarra River at Yarraville before flowing into Port Phillip Bay.

The Maribyrnong River has a history of significant flood events including events in 1906, 1916, and 1974. The last major flood of consequence was experienced in September 1993.

The river and its catchment area include Keilor, Kealba, Sunshine North, Braybrook, Avondale Heights, Maidstone, Essendon West, Moonee Ponds, Ascot Vale, Flemington, Footscray, Kensington, Maribyrnong and West Melbourne.

On 14 September 2022, VICSES regional staff conducted a spring readiness session in conjunction with a Unit Operations meeting for all North West Metro (NWM) units. As part of the

⁶⁴

Maribyrnong River. Melbourne Water. <https://www.melbournewater.com.au/water-and-environment/water-management/rivers-and-creeks/maribyrnong-river>

spring readiness activities, all units completed a prescribed readiness checklist, issued by the VICSES Chief Operating Officer in response to the La Niña conditions.

During the flood event, conditions shifted rapidly. The rain forecasts changed as did the actual river heights and flow measurements. This meant that the likelihood, level and extent of expected flooding also changed, as did the severity of warnings.

Prior to the flood event Melbourne Water ran and updated modelling using rainfall forecasts supplied by the BoM and produced flood outlook scenarios which were shared with VICSES to enable them to prepare.

Melbourne Water consulted with the BoM about the need for an initial flood watch to be issued. At 12:11 on 11 October, the BoM issued an initial flood watch for various catchments, including the Maribyrnong River. This led to increased flood forecasting, modelling and flood outlook scenario development, and daily updates to the flood watch.

At 14:30 on Tuesday 11 October 2022 the Premier, Emergency Management Commissioner and VICSES Chief Operating Officer provided a comprehensive media briefing at the State Control Centre (SCC) on the severe weather and flood outlook. The Maribyrnong River was mentioned as a risk on that day, and subsequently at the daily media conferences.

Based on preliminary intelligence, VICSES held a Teleconference with the metropolitan Units at 19:00 on Tuesday 11 October 2022 to discuss:

- updates on the flood predictions
- initial readiness planning (including Community Resilience Coordinators)
- plans for flood doorknocking activities to start the next day
- set-up of sandbag filling points at Windy Hill and Chelsea Unit Local Headquarters (LHQ).

On Tuesday 11 October 2022 a meeting was held with the three regional controllers for Metro Regions and it was agreed to establish a single Incident Control Centre (ICC). Consolidation of two ICC footprints was necessary due to the level of forecast risk and the requirement for resources elsewhere in the state. With flash flooding being the indicated significant risk in metropolitan areas, Dandenong ICC was chosen to cover both the Dandenong and Sunshine footprints, which incorporate the Maribyrnong River catchment. Resourcing plans were also established to enable 24/7 resourcing at Dandenong ICC and to fulfill other requests across the state.

VICSES also commenced a range of readiness activities in line with the Municipal Emergency Management Plan (MEMP), Flood Sub-Plan. This included providing comprehensive flood maps (with forecast peaks and associated consequences) to the Emergency Response Officer at Moonee Valley City Council.

On 11 October and 13 October 2022 VICSES issued 'Advice' and 'Watch and Act' flood warnings were issued for the Maribyrnong River in anticipation of the heavy rainfall forecast for the catchment area. VICSES knocked on the door of approximately 150 at-risk properties in Maribyrnong to warn of the risk of flooding later in the week.

Dandenong ICC commenced 24/7 operations on Thursday 13 October 2022 with the core Incident Management Team (IMT). At the same time, a Regional Control Centre was operating at Dandenong RCC for metropolitan Melbourne, based on dayshift only.

From 08:00 on Thursday 13 October 2022, Melbourne Water's Flood Preparedness Team moved to 24-hour monitoring. At 08:15 Melbourne Water prepared and sent to the BoM the first 'major' flood warning for the Maribyrnong, focusing on the upper Maribyrnong catchment. That warning indicated, among other things, that '[m]ajor flooding in the Deep Creek and Maribyrnong River catchment is expected to cause extensive inundation in the rural and/or urban areas, disruption to

traffic, and may be [sic] isolation of some properties' and that water levels, including for Maribyrnong River, were rising in response to the rain. The BoM issued that flood warning. Once the first major warning was issued, Melbourne Water provided six-hourly updates to the BoM who then disseminated those updates.

A sandbag collection point was also established on 13 October 2022 at Bunnings in Maribyrnong, with the location published on the VICSES website and on social media. The first sandbags began arriving at 11:45 from filling stations at Windy Hill in Essendon and Chelsea Unit LHQ in Bonbeach, established the previous day. The sandbag collection point operated between 13–14 October 2022, giving out over 6,800 sandbags.

In the afternoon of 13 October 2022, the BoM revised its rainfall forecasts. At 14:24 on 13 October 2022, Melbourne Water prepared and sent to BoM a 'moderate' flood warning for the lower Maribyrnong catchment based on this data. The BoM issued that flood warning. At 20:12 Melbourne Water prepared and sent to BoM a further 'moderate' flood warning for the lower Maribyrnong catchment. The BoM issued that flood warning.

Around 00:30 on 14 October 2022, Melbourne Water identified that the real time data showed the river was rising faster than the model had predicted. Melbourne Water updated its predictions in light of the real time data as it became available. Model runs take 30–90 minutes with a further 20–45 minutes required to process the outputs.

As soon as the decision to upgrade the warning was made Melbourne Water directly called VICSES to advise that Melbourne Water would be preparing and sending an upgraded Flood Warning.

At 02:16 on 14 October 2022, Melbourne Water prepared and sent to the BoM an update of the major flood warning including exceeding major flood for the lower Maribyrnong catchment. This new warning was issued by the BoM at 02:27.

Melbourne Water continued to monitor and regularly update modelling and forecasting over the course of the flood event.

The ICC established an intelligence briefing with Melbourne Water to determine the areas of impact, likely timing, flow rates, time to impact, priority areas for doorknocking and to support the creation of warning polygons to more specifically identify areas at greatest risk.

A Victoria Police Evacuation Manager and Traffic Management Officer were already in the ICC and immediately commenced planning for evacuations and road closures.

VICSES activated a number of units to send crews, lights and sirens for doorknocking. Essendon, Footscray, Port Phillip, Hobsons Bay, Heidelberg and Fawkner responded with crews, with Essendon, Footscray, Port Phillip, Monash, Chelsea and Pakenham also activating flood rescue boat and swift water rescue crews.

The major flood warning triggered the evacuation of approximately 60 houses in the Maribyrnong area at 04:00 on 14 October 2022. At-risk residents were again door-knocked by VICSES and Victoria Police.

Just after midday, the Maribyrnong River peaked at 4.216 m.

Despite the challenges, VICSES boat rescue crews from Footscray, Essendon, Pakenham and Monash units successfully undertook 31 rescues in Maribyrnong that morning, including over 60 people and some pets. They also assisted over 20 Maribyrnong residents, who had self-evacuated and had no access to their vehicles to get to the local relief centre.

VICSES volunteers were supported by rescue crews from LSV, FRV, and Victoria Police.⁶⁵

In total, VICSES and emergency services partners responded to 70 requests for assistance between 13–14 October 2022.

The flows dropped to below minor flood level on of 1.7m AHD at approximately 02:00 on 15 October 2022.

Review into the Maribyrnong River Flood Event

Melbourne Water is undertaking an independent technical review of the Maribyrnong River Flood event. The terms of reference for the review is available on the Melbourne Water website.⁶⁶

The review focuses on aspects which are within the roles and responsibilities of Melbourne Water. Public submissions closed on 17 March 2023 and the submissions are available on the Melbourne Water website.

Melbourne Water's submission to the review sets out further details about the flood event, including the causes of and contributors to the flood event.

The findings of the review are expected to be published in September 2023.

8.2.8 Murray River

The Murray River is Australia's longest river, rising in the Australian Alps in NSW, and flowing 2508 km to its mouth at Goolwa in South Australia.⁶⁷ The Murray River forms part of the Murray-Darling Basin along with the Darling River and 20 other major rivers. The Murray-Darling Basin is Australia's largest freshwater system, comprising an interconnected system of rivers across 22 catchments. This includes most of northern Victoria and catchments such as the Loddon–Avoca, Goulburn–Broken, Campaspe, Ovens, Kiewa, and Mitta Mitta.⁶⁸

Towns and settlements along the Murray in Victoria include Wodonga, Barmah, Echuca, Torrumbarry, Koondrook, Murrabit, Swan Hill, Nyah, Robinvale, Mildura and Yelta. The Darling River meets the Murray downstream from Mildura at Wentworth, located on the NSW side of the river.

The Murray River has a history of significant flooding including events in 1870, 1906, 1956, 1974, 1975, 1981 and 1993. The last major flood of consequence was experienced in November 2016.

The prolonged nature and magnitude of the 2022 Flood Event is illustrated by the impact along the Murray River and throughout its catchments. Continuous high and widespread rainfall resulted in major flooding in the convergence of rivers across Victoria and NSW on the Murray River, impacting numerous settlements, towns and communities between October 2022 and January 2023, from as far east as Bandiana on the Kiewa River to Mildura in the west.

Echuca

The Murray at Echuca experienced moderate to major flooding between 16 October and 1 December 2022, with the river at major flood levels for 25 days between 20 October and 13 November. The peak of 94.99 m AHD occurred on 26 October 2022 at 23:45.

⁶⁵ *Community Matters*, Summer 2022 (Edition 21), VICSES.

⁶⁶ <https://yoursay.melbournewater.com.au/maribyrnong-river-flood-review/about-review>

⁶⁷ [Longest Rivers. Geoscience Australia \(ga.gov.au\).](https://www.ga.gov.au/longest-rivers)

⁶⁸ [Where is the Murray–Darling Basin? Murray-Darling Basin Authority \(mdba.gov.au\).](https://www.mdba.gov.au/murray-darling-basin)

BoM issued their first flood warning for Echuca at 16:11 on Friday 14 October 2022. The warning was for major flooding and noted that, 'The Murray River at Echuca Wharf is likely to reach the major flood level (94.40 m AHD) from around mid to end next week. The river level may reach around 95 m AHD around 21–24 October, with major flooding. This level is similar to the October 1993 flood event. Further rises are possible'. The complementary VicEmergency 'Emergency Warning – Evacuate Now' was issued by VICSES at 2.28pm on Friday 15 October. The warning and notification were issued around 11 days before the flood peak in Echuca.

Another 23 flood warnings were issued by BoM before the observed flood peak at Rochester. These were accompanied by a further 34 VicEmergency notifications issued by VICSES before the flood peak. The VicEmergency notification was escalated to 'Emergency Warning – Not Safe to Return' at 19:05 on Wednesday 2 November 2022 to reflect the slow recession of flood waters following the flood peak on Wednesday 26 October 2022.

The flows dropped to below minor flood level on 5 December 2022.

There were two Emergency Alert campaigns for Echuca. The first was delivered at 16:11 on Saturday 15 October 2022 and the second at 08:28 on Sunday 16 October. The later campaign disseminated the following message:

Emergency. Flood Evacuate Now from the Victoria State Emergency Service for parts of Echuca and Echuca Village. You should evacuate your property now and move to a safe location. You should ensure you have left your property by 12 PM midday today. Safely secure or place valuables and important documents as high as possible. Do not forget to take pets and medication with you. For more information listen to local radio or visit www.emergency.vic.gov.au. If you require assistance evacuating call the SES on 132 500.

The Emergency Alert was successfully delivered to 1014 landlines and 7953 mobiles.

VICSES briefed the Echuca Moama Flood Study Community Reference Group on 15 September 2022. The attendees were informed about the seasonal flood outlook, flood warning system, levee management arrangements and preventative actions to protect their property and wellbeing.

Downstream of Echuca to Mildura

The largest flood to occur in and around Torrumbarry was in October 1975 with a peak of 7.84 m.

The Murray River was in moderate to major flood at Torrumbarry between 9 October and 10 November 2022, peaking at 7.8 m on 24 October and again on 26 October. Major flooding at Torrumbarry lasted 50 days from 16 October to 4 December 2022.

Koondrook (Barham) experienced major flooding for 61 days between 14 October and 13 December 2022, with a peak of 6.2 m on 26 October 2022. Further downstream at Barmah, the Murray was in major flood from 21 October to 26 November 2022, peaking on 23 October at 7.3 m.

At Robinvale (Euston), the Murray was in moderate flood between 13 November and 26 December 2022, peaking at 52.02 m AHD on 9 December 2022. Moderate flood levels were observed at Mildura between 21 November 2022 and 3 January 2023, with major flooding peaking at 38.52 m AHD on 15 December 2022.

The flows dropped to below minor flood level at Mildura on 20 January 2023.

A range of community meetings were undertaken during late October into December, as the flood event moved along the Murray River. These meetings and activities were conducted in a number of locations including Swan Hill, Robinvale, Sea Lake, Mildura, Nangiloc, and Red Cliffs.

Mallee Catchment Management Authority in collaboration with stakeholders, created indicative flood map to demonstrate possible flood affected areas. These maps were utilised at community meetings to inform appropriate response actions.

VICSES in collaboration with the North Central and Mallee CMAs, Swan Hill Rural City and Mildura Rural City conducted flood awareness community activities in Swan Hill on 12 September 2022, Robinvale on 8 September 2022 and Mildura on 3 October 2022. These activities consist of a VICSES public presence in prominent public locations such as local supermarket, tourist centre, and shopping mall. The attendees were informed about the flood warning system, levee management arrangements and preventative actions to protect their property and wellbeing.

On 19 October 2022 VICSES set up an ongoing daily call with the operations section of the Swan Hill Incident Control Centre and the local flood observers within the Gannawarra and Swan Hill municipalities. This daily call was maintained for the duration of the flood event whilst the Swan Hill ICC was in operation. The daily call was invaluable in obtaining local flood intelligence that was used to coordinate local flood response efforts.

8.3 Cross-border coordination and considerations

Shared responsibility between states improved communications and planning for cross border communities, and enabled access to inter-jurisdictional relief support.

The Murray River is one of Victoria's largest water catchments and, in many parts, provides the border between Victoria and NSW. Planning and communication between jurisdictions were needed during the floods to ensure consistent decision making that would not further impact border residents or cause additional consequences. The different needs of cross border communities also required equal consideration.

The Victorian Cross Border Commissioner (the Commissioner) was engaged to connect with ICCs and State Relief leads and communicate proactively on behalf of border residents. This provided a mechanism for the Commissioner to advocate for issues or matters, and to provide support and connections as required. The Commissioner's engagement in this event reflected the lessons learnt from the 2019–20 fires.

An important area of advocacy was for reciprocal access to relief centres. This approach was supported by the NSW Cross Border Commissioner and ensured border residents had access to relief centres and support that was most practical, regardless of their home state. Through the engagement of the Cross Border Commissioner, the Victorian and NSW State Relief leads were able to connect and agree to:

- coordinate relief efforts along the Murray River
- share support information so that a person presenting at a relief centre on either side of the border could get access to things like useful links and phone numbers from their home state.

It's important that future flood events occurring near border towns similarly focus on collaboration and consistency in cross-state planning so that residents have access to all available information and support.

8.4 Impacts on communities

The 2022 Flood Event had significant and widespread impacts on thousands of people across Victoria, impacting 63 LGAs and leaving almost 3,500 homes damaged or destroyed. These impacts followed other recent events, including the COVID-19 pandemic and, for some communities, the 2019–20 bushfires. The compounding and enduring nature of these emergency events reduces the ability of people, communities, business and the environment to recover effectively, and ultimately erodes resilience.

While many of the impacts were immediately visible, others will take more time to become fully apparent. The longer-term impact on people's mental health and wellbeing, livelihoods, and access to safe and affordable housing present significant challenges to government policy programs and service delivery. These impacts are not evenly felt across the community, with vulnerable and disadvantaged people more likely to face longer-term recovery challenges.

The extent of impacts on Aboriginal places, objects and other values, such as song lines and story are still being understood. Many registered and unrecorded sites of cultural heritage significance are located adjacent to rivers and streams. Some may also be at risk of damage from emergency stabilisation and remediation works. The Victorian Government is committed to working in partnership with Traditional Owners, including supporting displaced people to reconnect with community and continue cultural practices.

The Government acknowledges the unique role Traditional Owners hold in the management of Country and facilitates the self-determination and the assertion of their rights and interests over Country in flood and emergency management. In accordance with rights and obligations under legislation including the *Aboriginal Heritage Act 2006*, *Native Title Act 1993 (Cth)* and *Traditional Owner Settlement Act 2010 (Vic)* as well as the *Charter of Human Rights and Responsibilities Act 2006 (Vic)*, government is obligated to engage with Traditional Owners who assert rights, interests and cultural authority in an area, at the earliest possible opportunity.

While impact assessment is ongoing, in the immediate aftermath of the Flood Event the Victorian Government has announced significant funding for relief and recovery programs and services. Many of these will be cost-shared with the Commonwealth under Disaster Recovery Funding Arrangements (DRFA). Victoria's relief and recovery arrangements and an overview of key relief and recovery programs for the Flood Event, are detailed in Chapter 11.

8.5 Impacts and recovery on public land

The October 2022 Flood Event impacted 63 LGAs and an Alpine resort, over 4,419 km of public roads, and approximately 210,553 hectares of public land. It also resulted in high numbers of injured and displaced wildlife, damage to critical water assets, and impacts to communities and primary producers from residual water in the landscape.

DEECA holds significant lead agency recovery responsibilities under the SEMP, including:

- working with other public land managers to rehabilitate, restore and reinstate public land and assets (including roads, bridges, crossings and visitor assets)
- mitigating risks to threatened species and ecosystems
- rehabilitating injured wildlife
- restoring water services and sewerage
- supporting primary producers.

DEECA's emergency recovery works program is currently addressing the significant impacts across regional Victoria, particularly in northern Victoria, and includes:

- reinstating safe access and undertaking emergency stabilisation and safety repairs to roads, bridges, crossings, recreation sites and community facilities run by volunteer committees of management
- protecting Aboriginal cultural places including ancestral burial sites, archaeological sites and heritage-listed assets
- supporting wildlife welfare needs and protecting aquatic species at risk from poor water quality

- reinstating and managing risk to waterway health and water quality, as well as waterways infrastructure and systems
- supporting primary producers and local economies.

As part of DEECA's preparedness for emergency events, a dedicated core recovery team was already in place. It was ready to commence state-wide recovery planning and secure immediate funding. This enabled DEECA to deliver early interventions to manage immediate risks to communities and the environment, minimising costs to government that would arise if they were left to compound.

Since 2019, DEECA (and its predecessors) has been planning and delivering continuous, overlapping recovery programs in response to significant emergencies including major bushfires, multiple storms and floods, and resultant energy emergencies. The recovery efforts needed for these recent emergencies have required mobilisation of significant resources. The Victorian Government has invested more than \$700 million across the Environment, Water, Energy, Planning and Agriculture portfolios.

Sustained, long-term investment in 'building back better' and embedding climate adaptation considerations into recovery planning ensures the benefits of this investment can be fully realised in infrastructure, community and environmental resilience to future events.

9. Flemington Racecourse flood wall

Key points

This chapter considers the decision of the Minister for Planning to approve the construction of a flood wall around Flemington Racecourse.

It explains that the decision was made in accordance with the Melbourne Planning Scheme. Climate change and floodplain management were relevant considerations under the Melbourne Planning Scheme.

9.1 Planning considerations

9.1.1 The planning permit determination

The Flemington Racecourse flood wall required a planning permit under the provisions of the Melbourne Planning Scheme (MPS). The Minister was the responsible authority for the consideration of the permit application under the provisions of the then-MPS.

On 24 March 2003, the Victoria Racing Club, c/o Environmental Resources Management Australia Pty Ltd submitted Planning Permit Application No. 2003/086 for 400 Epsom Road, Flemington. The permit sought approval for reconstruction works at the racetrack including raised and regraded levels. It also sought approval to build a:

- 2.4 metre high gabion rock bund flood wall along the racecourse's river boundary
- landscaped mound topped with cyclone wire security fencing
- red brick wall along a section of Smithfield Road.

At the time of the application in 2003, the land was zoned Special Use Zone 1 – Flemington Racecourse, and was also covered by the Land Subject to Inundation Overlay (LSIO). Due to the LSIO, the application was referred to Melbourne Water – the relevant floodplain management authority – under section 55 of the *Planning and Environment Act 1987* (the PE Act).

Melbourne Water advised of no objection to the issuing of a planning permit subject to 39 conditions and footnotes, including certain mitigation works.

In summary the conditions requested by Melbourne Water related to:

- Compensating works to offset increase in Maribyrnong River 100 year flood levels
- Flood wall design
- Floodwall construction
- Floodwall maintenance
- Stormwater outlets to the Maribyrnong River
- Emergency response planning
- Stormwater quality impacts on the Maribyrnong River – during construction
- Stormwater quality impacts on the Maribyrnong River – after construction
- Finished surface levels
- Landscaping.

Notice and referral of the application was undertaken and Melbourne City Council, Maribyrnong City Council and Moonee Valley City Council, a number of community groups, individuals, and stakeholders submitted objections to the grant of a planning permit.

A total of 35 objections were received including objections from:

- Melbourne City Council
- Maribyrnong City Council
- Moonee Valley City Council
- various community groups, individuals and stakeholders.

In summary, the concerns raised in the objections were:

- Impact that the flood protection works may have upon flood levels elsewhere along the Maribyrnong River floodplain.
- Request for the Arundel Basin to be constructed.
- Flood wall will be unsightly and detract from both the riverscape, Maribyrnong River and streetscape along Smithfield Road.
- Create a precedent which would allow other sites to seek flood protection irrespective of the adverse impact it will cause on other lands.
- Flood wall will have a neutral effect on the flooding in the area, a positive effect is requested.

The Minister determined the application under section 61 of the PE Act and issued a Notice of Decision to Grant a Planning Permit under section 64 on 5 February 2004.

A number of parties sought a review of the Minister's decision under the *Victorian Civil and Administrative Tribunal Act 1998* (VCAT Act) and the proceeding was referenced as P548/2004.

On 1 April 2004, the Minister for Planning exercised the power under Section 58(2) and Clause 58 of Schedule 1 of the VCAT Act 1998 to 'call in' the application for review (No. P548/2004) of a decision under the PE Act, from the Tribunal, on the basis that:

- the subject application for review raises a major issue of policy regarding the development of the Flemington Racecourse at Flemington, and
- the determination of the application for review may have a substantial effect on the achievement of planning objectives enunciated in the State Planning Policy Framework and the objectives in the Municipal Strategic Statement of the Melbourne Planning Scheme.

All parties to the review were requested to provide additional submissions. Melbourne Water provided additional information that on the basis of the report by GHD that the proposed works and the permit conditions relating to compensatory works elsewhere in the catchment were sufficient at the time of the decision.

VCAT Call in process

Under section 58(2) and Clause 58(2)(a) of Schedule 1 of the VCAT Act the Minister administering the PE Act can call in a proceeding before the Tribunal and, thereby, require VCAT's principal registrar to refer proceedings to the Governor in Council for determination. The proceedings that may be referred to the Governor in Council for determination are those, which the Tribunal has not commenced hearing and which raise a major issue of policy and the determination of the proceeding may have a substantial effect on the achievement or development of planning objectives.

On the Minister's recommendation, the Governor in Council determined that, under Clause 58(2)(a) of Schedule 1 of the VCAT Act, the Application for Review No. P548/2004 made under the PE Act in relation to land at Flemington Racecourse, 400 Epsom Road, Flemington by the following parties:

- Melbourne City Council
- Maribyrnong City Council
- Moonee Valley City Council
- a resident of Maribyrnong
- Maribyrnong Residents Association Inc

be determined by dismissing the review and by directing the Minister for Planning, as the responsible authority, to issue a planning permit for the land to be used and developed for racecourse track upgrade and flood protection works, in accordance with the conditions contained in the Schedule (which went on to form part of the permit).

The Minister for Planning issued the planning permit as ordered by the Governor in Council on 3 August 2004.

9.1.2 Planning scheme considerations

At the time of the determination of the planning permit application, the proposal was required to be considered against a number of matters including:

- The PE Act and Regulations
- Melbourne Planning Scheme, including
 - State Planning Policy Framework
 - Municipal Strategic Statement
 - Local Planning Policy Framework
 - Zone provisions
 - Overlay provisions
 - General provisions including referral provisions.

9.1.3 Minister for Planning and Governor in Council consideration

In making the decision to approve the planning permit, the Minister for Planning and Governor in Council considered that the proposed development achieves the policy aims and objectives for this part of the City as described in the State Planning Policy Framework (SPPF) and the Municipal Strategic Statement (MSS) – City Plan. The reasons were set out as follows:

State Planning Policy Framework

- Clause 14.02, Metropolitan Development: General Implementation highlights the importance of the Capital City role of the City of Melbourne as the major Victorian focus of activity in finance, retail, commerce, tourism, culture and entertainment. It is considered that the development of Flemington Racecourse will contribute to the City's role in tourism, culture and entertainment.
- Clause 15.01-2 Catchment planning and management: as responsible authority the Minister for Planning has coordinated the development proposal with Melbourne Water to achieve best practice in implementing appropriate measures to achieve a neutral effect on the flood levels.

- Clause 15.02 Floodplain management: Melbourne Water has determined that flood risk from the development proposal will achieve a neutral effect in accordance with its mandatory conditions of permit including the mitigation works.
- Clause 15.10, Open space - aims to create a diverse and integrated network of public open space. The development will contribute to this objective by enhancing links from surrounding residential areas to the Maribyrnong River and the continuity of the east river bank trail.
- In particular, the development proposal is consistent with Clause 17.04 Tourism, as the Flemington Racecourse redevelopment will maximise the long term economic and cultural benefits of developing the State as a competitive domestic and international tourist destination.

The Municipal Strategic Statement

- The proposal will address Aim 3.2.1 of the MSS 'Staging of culturally relevant events that have a positive impact on the City', which aims to develop Melbourne's identity as a centre for sporting events by:
 - promoting and strengthening the City's national and international identity as a centre for major sporting events and sports tourism,
 - supporting the Flemington Racecourse...
- Similarly Aim 3.2 recognises the need "To maximise the positive benefits of events and festivals".
- Outcome 3.2.3 identifies the City of Melbourne as a centre for major sporting events and sports tourism and in contributing to this the Council will "cooperate with the State Government to develop or redevelop facilities and infrastructure that have net community benefit and demonstrate best practice in environmental planning."
- Outcome 3.3.2 seeks to identify priorities and invest in upgrading and or redevelopment of existing sporting facilities.
- The MSS also recognises the importance of facilitating the operation of the Flemington Racecourse as a capital city facility of national importance.

9.1.4 Climate change considerations

At the time the decision was made in 2004, the phrase 'climate change' was not used in the Melbourne Planning Scheme.

However, 'Clause 11.03-2 Environment' in the MPS required consideration via the Inter-Governmental Agreement on the Environment. Clause 11.03 specifically advised planning should:

- Adopt a best practice environmental management and risk management approach which aims to avoid or minimise environmental degradation and hazards.
 - Protect areas and sites of significant historic, architectural, aesthetic, scientific and cultural values.

Under the then-State Planning Policy Framework, the MPS required consideration of:

- Clause 15.01-2 Catchment planning and management
- Clause 15.02 Floodplain management.

10. The implications for future planning decisions

Key points

This chapter describes Victoria's land use planning system under the *Planning and Environment Act 1987* and building system under the *Building Act 1993* (Building Act) and Building Regulations 2018. It outlines the function of the *Victoria Planning Provisions* and the role of planning schemes as statutory instruments that set out objectives, policies and provisions relating to the use and development of land.

State planning policy for floodplain management and climate change impacts must:

- consider flood risk in strategic and statutory land use decisions
- ensure decision makers have the best available climate data and science
- ensure new applications take into account risk to life, health, property and safety.

10.1 The role of Victoria's planning and building system in responding to hazard and risk

The planning and building portfolio areas are important components of the broader overall response to risks posed by flood hazards. Both systems:

- are essential for managing flood risk, especially for individuals and communities. They help determine the most suitable places for development and the types of development.
- inform decisions about new land use and development, including major urban renewal, so are part of the comprehensive response required to identify and manage flood hazard and risk.

State land use and building policy also helps reduce the impact of and recovery from natural hazard events.

The system is updated to reflect new government policy and data, including on climate change. The government is invested in the planning system through reforms to improve its useability by streamlining assessment and approval processes and maintaining responsive building construction standards.

10.1.1 Land use planning

The *Planning and Environment Act 1987* (PE Act)⁶⁹ establishes the statutory framework for the use, development and protection of land, including planning schemes. Planning schemes can, among other things, 'regulate or prohibit any use or development in hazardous areas, or areas likely to become hazardous'.⁷⁰

Victoria's planning schemes are based on a template of standard planning provisions, the Victoria Planning Provisions (VPP). The VPP enables state and local governments to implement their land use planning policies and bring about positive changes to the built environment. The VPP set standardised planning provisions, including state planning policy, zones and overlay controls for hazards like flood. The VPP and planning schemes implement the state's floodplain-related strategies, policies and guidelines including:

⁶⁹ [Planning and Environment Act 1987 \(legislation.vic.gov.au\)](https://www.legislation.vic.gov.au/Planning-and-Environment-Act-1987).

⁷⁰ *Planning and Environment Act 1987*, s 6(2)(e).

- the Victorian Floodplain Management Strategy 2016⁷¹
- Guidelines for Development in Flood Affected Areas (DEECA).⁷²

The Department of Transport and Planning (DTP) is always reviewing the effectiveness of state planning requirements, tools and the VPP. Given the planning system's role in helping to implement the state's floodplain and climate strategy and policy, any changes to these planning mechanisms require the endorsement of the Water and Environment and Climate Action portfolio areas.

Planning Policy Framework

State planning policy for floodplain management requires:

- flood risk to be considered in strategic and statutory land use decisions
- development applications to consider potential flood risk to life, health, property, the natural environment and community infrastructure.

State floodplain strategies are as follows:

- Identify land affected by flooding, including land inundated by the 1 in 100 year flood event (1 per cent Annual Exceedance Probability) or as determined by the floodplain management authority in planning schemes.
- Avoid intensifying the impact of flooding through inappropriately located use and development.
- Plan for the cumulative impacts of use and development on flood behaviour.
- Locate emergency and community facilities (including hospitals, ambulance stations, police stations, fire stations, residential aged care facilities, communication facilities, transport facilities, community shelters, child care centres and schools) outside the 1 in 100 year (1 per cent Annual Exceedance Probability) floodplain and, where possible, at levels above the height of the probable maximum flood.
- Locate use and development that involve the storage or disposal of environmentally hazardous industrial and agricultural chemicals or wastes and other dangerous goods (including intensive animal industries and sewage treatment plants) outside floodplains unless site design and management is such that potential contact between such substances and floodwaters is prevented, without affecting the flood carrying and flood storage functions of the floodplain.
- Ensure land use on floodplains minimises the risk of waterway contamination occurring during floods and floodplains are able to function as temporary storage to moderate peak flows and minimise downstream impacts.⁷³
- Under the natural hazards and climate change State planning policy, any decisions must minimise the impacts of natural hazards and accommodate climate change, through risk-based planning. Decision makers are required to apply the best available climate data and science when identifying at risk areas.⁷⁴

This is an all-hazards, all-portfolio areas responsibility.

⁷¹ [Victorian Floodplain Management Strategy \(2016\). Department of Environment, Land, Water and Planning \(water.vic.gov.au\).](#)

⁷² [Guidelines for Development in Flood Affected Areas 2019. Department of Environment, Land, Water and Planning \(water.vic.gov.au\).](#)

⁷³ [13.03 FLOODPLAINS, Floodplain management \(2023\). Victoria Planning Provisions Planning Scheme.](#)

⁷⁴ [13.01 CLIMATE CHANGE IMPACTS, Natural hazards and climate change \(2023\) Victoria Planning Provisions Planning Scheme](#)

Strategic planning

Spatial or urban management issues addressed at the strategic scale balances new urban growth and natural hazard risks (for example, expanding the location and direction of a settlement). A key aim of strategic planning at the state, regional and local level is to integrate settlement patterns, land use and infrastructure to avoid and minimise community risk from the start.

The planning system allows risk to be managed in existing settlements via redevelopment in line with contemporary planning provisions and building standards and best available data.

Plan Melbourne 2017–2050 (Plan Melbourne)⁷⁵ and Regional Growth Plans⁷⁶ strengthen strategic planning to better manage population growth and focus urban development on low-risk sites or places with improved resilience.

Statutory land use planning

Planning scheme mapping and provisions identify flood hazards to enable risk assessment at the permit application level. Depending on the risk, the relevant planning provisions guide decision making in managing the impacts of flood. This includes referrals to the floodplain manager as the technical authority.

Zoning provisions – the Urban Floodway Zone (UFZ) – control land use and development while overlay provisions control development. These three overlays control development on flood affected land:

- Floodway Overlay (FO)
- Land Subject to Inundation Overlay (LSIO)
- Special Building Overlay (SBO).

For manageable risks, the planning system has a role in identifying and communicating risk to land holders, and using planning controls at the subdivision and lot scale to ensure appropriate mitigation measures are built into development design requirements.

Statutory planning contributes to the long-term resilience of existing settlements by applying contemporary building standards to replacement buildings. An area's potential flood risk determines its level of planning control.

For example:

Flood studies

These are prepared by floodplain management authorities (FMAs) and councils. They are translated into planning scheme zone and overlay controls through the planning scheme amendment process.

All new government funded flood study maps must:

- combine local knowledge and flood studies
- use the most recent edition of *Australian Rainfall and Runoff* and consider the state's Planning Policy Framework strategies, including those managing the impacts of coastal climate change.

⁷⁵ [Plan Melbourne 2017–2050 \(planning.vic.gov.au\)](https://www.planning.vic.gov.au/plan-melbourne-2017-2050).

⁷⁶ [Regional growth plans \(planning.vic.gov.au\)](https://www.planning.vic.gov.au/regional-growth-plans).

- The UFZ prohibits most land use and development in a flood zone because the land's primary function is to carry active flood flows. It is used to allow low intensity uses and developments like recreation, in high-risk urban environments.
- The FO carries flood water like the UFZ, but with less risk. It is designed for rural and urban riverine flooding and is applied in places where the focus is more on controlling development.
- The LSIO identifies lower flood risk land or is used as an interim measure for areas that have not been fully flood mapped. It also identifies areas affected by coastal flooding. LSIO areas generally have a less immediate flood risk than UFZ or FO areas.
- The SBO applies to urban stormwater flooding or overland flows in urban areas.

Decisions about the use and development of land, including zoning, are made by the relevant local planning authorities (usually councils) and technical experts – floodplain management authorities (FMAs) – as per the PE Act and the local planning scheme.

State coastal planning policy

As per the Marine and Coastal Policy 2020 any development must plan for a possible sea level rise of not less than 0.8 metres by 2100. They must consider the combined effects of tides, storm surges, flooding, coastal processes and local topography and geology in assessing climate change related risk and coastal impacts.

Planning decisions must also align with the *Victorian Floodplain Management Strategy 2016*.

Referrals and notice

The PE Act allows FMAs (CMAs, including Melbourne Water, as referral authorities) to advise councils on flooding. Section 55(1) of the PE Act provides that a council must give a copy of an application for a planning permit to every person or body that a planning scheme specifies as a referral authority for the particular kind of application unless an applicant satisfies the responsible authority that the referral authority has: (a) considered the proposal for which the application is made within the past three months; and (b) stated in writing that it does not object to the granting of the permit for the proposal. A planning scheme requires that a copy of an application must be provided to an FMA where the land is in a flood zone or overlay, unless specifically not required by the zone or overlay.

A referral authority can **determine** or **recommend**.⁷⁷ Under sections 61 and 62 of the PE Act, a council must:

- refuse a permit if a relevant determining referral authority objects and may refuse a permit if a relevant recommending referral authority objects, or
- a council must include on the permit any conditions that are required by the planning scheme or a relevant determining referral authority and may include any other condition, including (among other things) a condition recommended by a recommending referral authority.

The council, as the responsible authority, must consider the degree of flood hazard associated with the location of the land, and the use, development or management of the land, before deciding about an application or approving a plan. This is done in line with the Clause 65 Decision

⁷⁷

CMAs formerly had the same referral power of refusal over planning applications as Melbourne Water. However, the *Planning and Environment Amendment (General) Act 2013* implemented changes to CMAs status in the planning scheme by designating them as recommending referral authorities.

Guidelines of the VPP and planning scheme. The aim is to reduce the risk of flood hazards. It also extends consideration of flood issues to all planning permit applications, whether or not the site is affected by a flood zone or overlay.

Where no flood zone or overlay is in place, the council may seek the informal technical advice on a planning permit application from the relevant FMA, but it is not required to. It can do this and is encouraged to do so where necessary under section 52 of the PE Act.

As authorities with floodplain management functions under the *Water Act 1989*, CMAs have the technical ability to take into account flood risk when assessing planning permit applications and to understand the long term implications to the property, adjoining properties and the catchment generally. Using their specialist knowledge, CMAs are, in most instances, able to manage risk by recommending conditions on a planning permit to the responsible authority (generally a council).

10.1.2 Building

The legislative framework in Victoria for regulating building and construction includes the *Building Act 1993* (Building Act), the Building Regulations 2018 and the national uniform building laws in the National Construction Code (NCC). The NCC is made up of the Building Code and Plumbing Code of Australia and sets minimum technical standards for construction of buildings and structures. The Australian Building Code Board (ABCB) is responsible for the NCC.

The NCC's main focus is built form requirements and occupant safety and a level of property protection. Construction standards are regularly updated to reflect new technological developments and new data on potential hazards, like flooding.

The building system prescribes minimum construction standards and requirements for onsite building. An area liable to flooding is a 'designated special area' under the Building Regulations.⁷⁸ Such areas can be determined as being liable to flooding under the *Water Act 1989* or identified as in local planning schemes, described as liable to flooding on a subdivision plan, or designated liable to flooding by the relevant council.

Buildings must be built to withstand a range of loads and actions from flooding and other natural hazards. Under the NCC, a building or structure must withstand liquids, groundwater and rainwater ponding. Specific building standards exist in flood hazard areas as per Performance Requirements BP1.4 in NCC Volume One and P2.1.2 in NCC Volume Two.

The Building Regulations require, subject to certain exceptions, the consent of the relevant council for a building permit if a site is subject to flooding. The council must not consent to a permit if it is of the opinion that there is likely to be a danger to the life, health or safety of the occupants of the building due to flooding of the site.⁷⁹

The council must specify a minimum floor level for the proposed building in consultation with the relevant floodplain management authority and assess the flood risk associated with the site.

The council must specify a minimum floor level of at least 300 mm above the 1% AEP flood level, unless the floodplain management authority consents to a lower level.¹ The regulations do not apply to a Class 10 building (non-habitable garage, carport or shed), an unenclosed floor area of a building or an extension to an existing building which is less than 20 square metres.

⁷⁸ Building Regulations 2018, Part 1, Division 2.

⁷⁹ Building Regulations 2018, regulation 153(4).

Council consent is also required for a building permit for a building on land or works designated in the Water Act. Before giving its consent, the council must consult with Melbourne Water or the waterway management authority⁸⁰.

Please note: The NCC doesn't cover storm tidal surges. The ABCB will continue monitoring natural disasters and identify gaps or inconsistencies between systems.⁸¹

10.1.3 Land use planning and climate change

Planning controls and new initiatives are always evolving and it is a government priority to update the VPP and planning schemes using the best available data and climate science to ensure the planning and building system enables climate resilience settlements and communities.

Victoria's inaugural *Built Environment Adaptation Action Plan (2022–26)*⁸² was released in February 2022 as one of seven sector climate change adaptation action plans under the *Climate Change Act 2017*.⁸³ It aims to strengthen planning, building and energy activities against climate change. It will bolster urban resilience along with other adaptation plans covering:

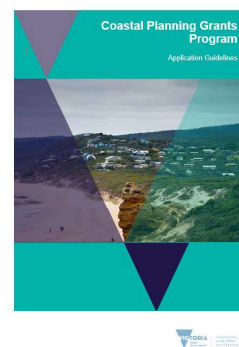
- transport
- water
- health and human services
- education
- the natural environment
- primary production.

DTP is delivering a roadmap for Victoria's planning system⁸⁴ to promote eco-friendly building and subdivisions. In June 2022, it updated its planning policy to better accommodate climate change.

Victorian Government funded assessments in priority areas along the coast are helping coastal adaptation planning. These were done in partnership with local governments, catchment and floodplain management authorities.⁸⁵ DEECA is preparing the Port Phillip Bay Coastal Hazard Assessment to better plan for coastal hazards in metropolitan Melbourne and has also provided grants, through the Victoria's Resilient Coast Program, to progress planning for the impacts of climate change on the coast.

Coastal planning

Consistent with *Victoria's Marine and Coastal Policy 2020*⁸⁶ and *Marine and Coastal Strategy 2022*,⁸⁷ state planning policy requires councils to apply the best available science and modelling to identify and assess coastal hazard risks like flooding and erosion and keep planning schemes up to date. The *Marine and Coastal Policy 2020* directs to avoid development in identified areas that are vulnerable to coastal hazard risk from impacts such as erosion and flooding (both estuarine and coastal), inundation, landslips and landslides, and geotechnical risk. The Policy also directs the use of a pathway approach for decision making, which is an adaptive approach that recognises the changing nature of climate change impacts.



⁸⁰ Building Regulations 2018, regulation 154(3).

⁸¹ As per the ABCB *Climate Change Adaptation Annual Report to Ministers 2017*.

⁸² [Built Environment Climate Change Adaptation Action Plan 2022–2026 \(planning.vic.gov.au\)](https://www.planning.vic.gov.au/built-environment-climate-change-adaptation-action-plan-2022-2026).

⁸³ [Climate Change Act 2017 \(legislation.vic.gov.au\)](https://www.legislation.vic.gov.au/Climate-Change-Act-2017).

⁸⁴ [Environmentally sustainable development of buildings and subdivisions \(planning.vic.gov.au\)](https://www.planning.vic.gov.au/environmentally-sustainable-development-of-buildings-and-subdivisions).

⁸⁵ [Victoria's Resilient Coast – Adapting for 2100+ \(marineandcoasts.vic.gov.au\)](https://www.marineandcoasts.vic.gov.au/victoria-s-resilient-coast-adapting-for-2100).

⁸⁶ [Marine and Coastal Policy 2022 \(marineandcoasts.vic.gov.au\)](https://www.marineandcoasts.vic.gov.au/marine-and-coastal-policy-2022).

⁸⁷ [Marine and Coastal Strategy 2022 \(marineandcoasts.vic.gov.au\)](https://www.marineandcoasts.vic.gov.au/marine-and-coastal-strategy-2022).

The Government's Coastal Planning Grants Program (DTP)⁸⁸ assists local government to implement detailed state-funded (DEECA) local coastal hazard assessments and other local projections in planning schemes using updated flood mapping and structure plans.

Program partners include:

- the Association of Bayside Municipalities
- East Gippsland Shire Council
- Moyne Shire Council
- Casey City Council.

State-funded local coastal hazard assessments have been implemented in planning scheme flood controls through:

- Bass Coast Planning Scheme Amendment C82 (Westernport Local Coastal Hazard Assessment)
- Mornington Peninsula Planning Scheme Amendment C216 (Westernport Coastal Hazard Assessment)
- Greater Geelong Planning Scheme Amendment C394 (Bellarine–Corio Coastal Hazard Assessment).

The Marine and Coastal Strategy 2022 includes an action to review and update planning benchmarks based on the latest and best available science (including Intergovernmental Panel for Climate Change (IPCC) reports) and amend the Marine and Coastal Policy accordingly. This action in the Strategy also includes establishing a process for future reviews and updates to the benchmarks. Under the *Marine and Coastal Act 2018*, the public must be consulted on any proposed policy changes. In addition to progressing a review of the sea level rise planning benchmark, the *Victorian Resilient Coast Program - Adapting to 2100+*⁸⁹ is being rolled out across the State. The program provides a state-wide approach for managing and adapting to coastal hazard risk and supporting councils and land managers to adapt to climate change along our coast. The program builds on the direction, adaptation measures and options in the *Marine and Coastal Policy 2020*.

In September 2021, Amendment VC171⁹⁰ updated the VPP and planning schemes to reflect the *Marine and Coastal Policy 2020* to help coastal hazard planning and adapt to rising sea levels. The Erosion Management Overlay now specifically includes 'coastal' erosion and the Land Subject to Inundation Overlay explicitly includes consideration of coastal and riverine inundation and erosion.

Coastal climate risk data and assessment

Coastal FMAs provide critical and consistent technical flooding and specialist advice for both statutory and strategic land use planning responses to manage coastal hazard and climate risk. CMAs and Melbourne Water advise councils on coastal inundation levels and extents for planning permit applications (including required freeboard above finished floor levels and alternative design responses) and planning scheme amendments.

State planning policy requires planning and responsible authorities to plan for sea level risk of not less than 0.8 metres by 2100, and allow for the combined effects of tides, storm surges, flooding,

⁸⁸ [Coastal Planning Grants Program \(planning.vic.gov.au\)](https://planning.vic.gov.au/coastal-planning-grants-program).

⁸⁹ [Victoria's Resilient Coast – Adapting for 2100+ \(marineandcoasts.vic.gov.au\)](https://marineandcoasts.vic.gov.au/victoria-s-resilient-coast-adapting-for-2100).

⁹⁰ Victoria Planning Provisions Planning Scheme – Amendments VC171.

coastal processes and local conditions such as topography and geology, when assessing risks and coastal impacts associated with climate change.

The Marine and Coastal Strategy provides for DEECA to among other things:

- build on the Victorian Coastal Monitoring Program⁹¹ to ensure its data informs coastal hazard mapping and projections, erosion advice, emergency responses and adaptation planning (Activity 3.1)
- establish advisory support for coastal erosion (Activity 3.5)
- review the latest IPCC sea level rise projections (Activity 3.9) during 2022–23
- update planning schemes and planning processes to respond to coastal climate change with DTP and local government (Activity 3.11).

These activities will contribute further changes to the VPP and planning schemes, as per existing state policy requirements.

⁹¹

[Victorian Coastal Monitoring Program \(marineandcoasts.vic.gov.au\)](https://marineandcoasts.vic.gov.au).

11. Other relevant matters

Key points

- Accelerating climate change, shifting population and settlement patterns, and compounding disasters mean that Victoria's emergency management systems will need to continue to evolve to build resilience to future challenges.
- The cost of disasters is expected to rise significantly in coming decades.
- Despite the importance of insurance in mitigating the financial risks of emergency events, many people and businesses are uninsured or under-insured.
- Relief and recovery activities are integrated across Victoria's emergency management arrangements, with emergency services agencies working in partnerships with non-government organisations, community groups and community members.

This submission aims primarily to provide the Committee with context and information that relates directly to its terms of reference. This final section provides additional information that the Committee may find relevant to its inquiry.

As highlighted throughout this submission, Victoria's emergency management sector has been strengthened by a long history of reform, based on continuous review and learning from previous emergency events. This approach meant Victoria's emergency management sector was well placed before the Flood Event to work with communities to prepare, respond and recover.

However, we face significant future challenges linked to accelerating climate change, including more frequent and intense extreme weather events and rising sea levels and coastal erosion. Shifting population and settlement patterns – including increased human settlement in floodplain areas – are also adding to the prospect of escalating future demand for emergency services that will necessitate continual change in our arrangements. The compounding effects of more frequent and intense natural disasters will challenge communities, infrastructure, economies and ecosystems, with increased costs to government, businesses and households. There will also be greater challenges associated with fatigue, physical and mental health and well-being and, ultimately, lower resilience among communities, individuals and emergency responders.

These complex issues are not confined to Victoria. It is therefore critical that we continue to work with other jurisdictions – across all levels of government – as well as with critical infrastructure operators, businesses and communities, to continue to improve our arrangements and build *safer and more resilient communities*.

The Victorian Government acknowledges the value of this inquiry as an opportunity to learn from the significant Flood Event of 2022, and as a vehicle to inform continuous improvement in our emergency arrangements and the resilience of our communities to floods and other emergency events. The following section provides further information that may assist the committee in advancing this objective.

11.1 Future costs of natural disasters

Analysis by Deloitte Access Economics in 2021 found that natural disasters cost Australia around \$38 billion) per year. This figure is expected to rise to \$73 billion a year nationally by 2060 even under a low emissions scenario.⁶⁴ Natural disasters in Victoria are expected to cost the state \$185

billion over the period 2020–2060 under the low emissions scenario, with the figure blowing out to \$206 billion if emissions continue to rise throughout the rest of the century.⁹²

The Victorian Government is continuing to work closely with other jurisdictions and the Australian Government to strengthen Disaster Recovery Funding Arrangements (DRFA) and to ensure that investment enables us to ‘build back better’ and improve the resilience of industry, communities and the environment, thereby minimising compounding impacts and costs from future events.

11.1.1 Independent Review into Disaster Funding

Recognising the implications of more frequent, severe and compounding natural disasters, the Australian Government has commissioned an independent review into how to optimise Commonwealth disaster funding arrangements. The review will look at opportunities to build a fit-for-purpose system to support community wellbeing, national productivity, prosperity and economic security, while maintaining state, territory and local government roles and responsibilities.⁹³ It will also take stock of Australia’s disaster funding environment in light of the significant financial support provided to communities affected by disaster events over the past three years.

The review will take approximately 18 months to complete, with the final report scheduled for April 2024.

The Victorian Government supports the review and is an active participant.

11.1.2 Disaster Recovery Funding Arrangements

Disaster Recovery Funding Arrangements (DRFA) is a cost-sharing arrangement between states and territories and the Australian Government⁹⁴ to provide financial assistance to support specified relief and recovery measures for natural disasters above a designated threshold. The DRFA includes four categories of assistance:

- Category A: Emergency assistance to individuals
- Category B: Repair of damaged essential public assets
- Category C: Clean-up and restoration grants and/or community recovery packages
- Category D: Exceptional circumstances.

The DRFA was activated for 63 local government areas and one alpine resort in response to the Victorian 2022 Flood Event. Funding for eligible services and programs across all categories has been activated.

After notification of an eligible disaster to the Commonwealth, financial assistance under categories A and B are activated by the state. Categories C and D ‘special assistance’ measures are activated by agreement between the Premier and the Prime Minister. The arrangements are well established, with Victoria having activated the DRFA for 86 events in the past ten years. There is no requirement to declare a State of Disaster or a State of Emergency to access DRFA funding.

Local government play a critical role in both immediate relief and local recovery. Extensive damage was also caused to local essential public assets. Council may claim eligible expenditure under the DRFA. Councils submit claims providing evidence of damage and direct costs incurred as a result of an event, and are reimbursed for these expenses for eligible activities and expenses once claims

⁹² [deloitte-au-economics-abr-natural-disasters-061021.pdf](#) (p. 12).

⁹³ [Independent Review into Disaster Funding \(2023\). National Emergency Management Agency \(NEMA\).](#)

⁹⁴ [Disaster Recovery Funding Arrangements \(DRFA\) Overview \(2018\). Emergency Management Victoria \(emv.vic.gov.au\).](#)

are assessed. Advance payments have been provided to 12 councils to mitigate any cash flow issues and eligible claims will be offset against this as they are assessed and approved.

The Australian Government's National Emergency Management Agency has been leading a review of the DRFA, which has led to several enhancements, including the introduction of off-the-shelf packages. With the agreement of the National Emergency Management Ministers Meeting, the review is being broadened to ensure that national disaster recovery arrangements are fit-for-purpose, nationally consistent, cost effective and structured to build long-term resilience through investment in recovery after emergency events.⁹⁵ Addressing resilience through programs that enable the upgrading of essential public assets is a welcome part of this broadened review.

These cost-sharing arrangements exist in tandem with various mechanisms for funding following natural disasters. Additional funding is also provided directly through the Victorian Government to activate and supplement government services and support programs, as well as targeted assistance payments funded by the Australian Government.

11.1.3 Insurance and recovery

Insurance is an integral part of risk management and the primary financial mechanism by which communities recover from catastrophes.

The affordability and availability of insurance is impacted by numerous factors such as risk exposure, expected claims cost, insurers' return on investment as well as insurance premium take up. The location of a property is one of the key risk factors considered by insurers, particularly in areas prone to natural perils. If insurers believe that this risk is increasing, then it is likely that prices will rise accordingly, and insurers may even impose embargoes where the risks are too high or unpredictable. Insurance plays an important role in signalling the risks of natural disasters.

Increases (in severity and frequency) in insurable events like floods (across Australia and globally) are placing upward pressure on premiums to cover claim costs. Construction costs have also risen dramatically due to higher demand for construction services (partly caused by East-Coast natural disasters), labour scarcity and supply chain issues. The increase in construction costs leads to costlier rebuilds of homes which is ultimately reflected in increased premiums to cover the additional costs. Cumulatively this can result in Victorians facing pressures of insurance affordability and availability.

The challenge for government is determining how it can assist in the most efficient, effective and sustainable way. Government policies can improve insurance affordability and availability if targeted correctly. As this submission notes, these policies span Planning, Construction regulation, Emergency Management, Taxation and other policy areas. The Victorian Government works with the insurance industry to coordinate urgent clean-up activities after a disaster, and to ensure that policy-holders benefit from Government-funded clean-up, rather than insurance companies. There is also opportunity for the Commonwealth government as part of its responsibilities for regulation of the insurance industry to consider if existing policy settings are appropriate.

The Victorian Government does not currently have a comprehensive understanding of the level of insurance uptake but anecdotally knows that it varies by location, ability to pay and perception of risk. The Victorian Government works with the insurance industry to understand the drivers of insurance affordability and availability. It will also undertake more detailed market analysis and consumer research in light of the Flood Event to better inform future policy.

The Department of Families, Fairness and Housing (DFFH) has developed the '*Insure it. It's worth it*' financial preparation guide in partnership with Good Shepherd as part of the department's commitment to supporting people and communities to overcome struggles and hardships and

recover from adversity. The guide is a simple approach to encourage people to check their financial readiness, understand the financial effects of a disaster and to start a conversation about financial wellbeing.

The guide is available on both the department's website⁹⁶ and the Good Shepherd website.⁹⁷ It has been designed to provide practical information and advice about the importance of home and contents insurance to reduce emergency-related financial risk and promote effective recovery.

Many government assets such as roads and schools were also affected by the floods. The Victorian Government has comprehensive insurance for its assets and activities with the Victorian Managed Insurance Authority, which greatly reduced the marginal cost to the State.

11.1.4 Availability of housing

Pre-existing constraints on housing supply and construction have exacerbated the impacts of the 2022 Flood Event. With limited availability of short-term accommodation and increasing housing repair times, many flood-displaced households are at high risk of homelessness and further disadvantage. Extremely low rental vacancy rates have been a feature of regional rental markets over the past five years and were exacerbated during the COVID-19 pandemic.

These pressures continue to drive up prices for renters and have placed strain on low-income families forced to move away from established social networks, jobs and schools. In some rural and regional communities, no suitable rental options are available for prospective tenants. Further, the pandemic and other global factors are impacting the building industry workforce and supply chains, particularly in regional areas, resulting in delays to rebuilding works and cost escalation.

11.2 Relief and recovery support

The Flood Event impacted 63 local government areas and one alpine resort, with an estimated 3499 homes damaged or destroyed. In the immediate aftermath, the Victorian Government announced more than \$1.8 billion in funding to assist affected individuals, households, businesses and communities. Some of this funding is eligible to be cost-shared with the Australian Government through the DRFA.

Examples of relief and recovery support activated in 2022 include:

- Individuals: emergency relief payments and emergency re-establishment assistance; emergency and temporary accommodation; recovery case support; food relief packages; mental health assistance; financial relief for affected families with kindergarten and school-aged children; support for senior secondary students undergoing final exams.
- Community: state-coordinated clean-up assistance; waiving the waste levy; increased health services in flood-affected areas; financial support for impacted sessional kindergarten services; community sport assistance
- Critical infrastructure: emergency road repairs; critical water infrastructure and continuation of essential water services
- Industry and business: small business and primary producer grants; tourism and events-targeted support

⁹⁶ www.dffh.vic.gov.au/insureit

⁹⁷ <https://goodshep.org.au/publications/guide-insure-it-its-worth-it/>

- Councils and emergency management workforce: Council flood support fund; additional community recovery officers; additional resourcing for the State Control Centre and emergency services agencies
- Natural environment: repair and restoration of public land and catchments
- Support for Aboriginal communities' self-determination: services and supports determined by local Aboriginal organisations and communities, including immediate infrastructure and housing needs; initiatives to ensure community and cultural connectivity; family support; local Aboriginal organisation support.

11.2.1 Demand for relief and recovery programs and services

Demand for key relief and recovery support has remained high since the 2022 Victorian Flood Event. In the period ending 31 March 2023, this included:

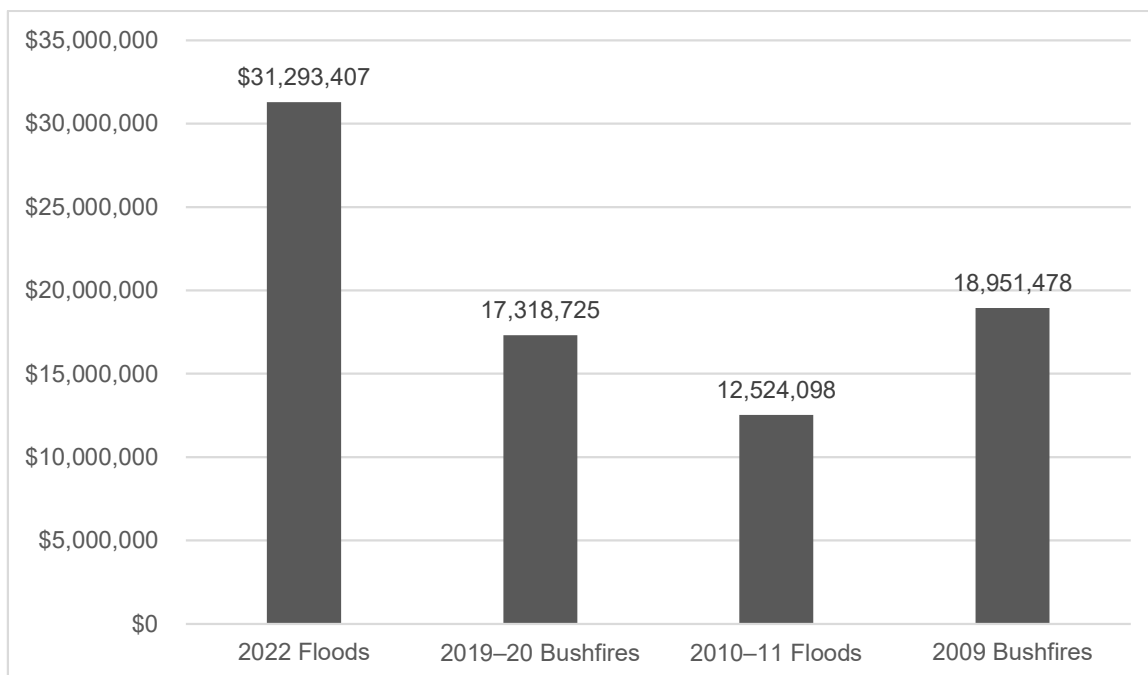
- 5,334 engagements with the recovery (case support) program
- 8,714 calls to the flood recovery hotline
- 1,859 requests for emergency accommodation
- 1,819 requests for clean-up.

Applications and grants for direct financial assistance up to 31 March included:

- 137,193 applications for the Australian Government Disaster Recovery Payment, with more than \$41.19 million (m) in payments
- 17,003 applications for the Australian Government Disaster Recovery Allowance, with more than \$16m in payments
- 2,500 grants approved for businesses under the Primary Producer and Rural Landholder grants program
- 900 applications for small business grants
- 27,665 emergency relief payments (total \$24.01m) and 683 emergency re-establishment payments (total \$7.28m) disbursed by DFFH through the Victorian Personal Hardship Assistance Program.

Emergency relief payments support people to meet urgent needs such as paying for food, accommodation, clothing and medication. Emergency re-establishment payments support people on low incomes to repair or rebuild uninsured homes damaged by natural emergency events. The total value of hardship payments made by the end of March 2022 for the Flood Event, was 65 per cent higher than total payments made for the 2009 Victorian bushfires.

Figure 13: Personal Hardship Assistance Program payments (relief and re-establishment) per major event – as at 29 March 2023.



11.2.2 Recovery coordination and support

While response and relief activities aim to meet the immediate needs of affected people and communities, medium and longer-term recovery needs are different for each individual and community. Once emergency response activities have ceased, management of the emergency moves into the recovery phase, which occurs at incident, regional and state levels. In this phase, recovery agencies work with communities to meet needs.

Emergency Recovery Victoria is the designated agency supporting and coordinating state and regional recovery programs and services. The extent and significant impact of the 2022 Flood Event saw the activation of a range of recovery services and programs. Many will continue for months, or even years.

Case Study 5: Community relief and recovery actions

The Inspector-General for Emergency Management's *Inquiry into the 2019–20 Victorian fire season Phase 2 Report* highlighted the sacrifices of the many volunteers who spontaneously offer help during and immediately following a major emergency, and the need for improved ways to engage with and harness their expertise and efforts. This need has increased amid a noticeable shift away from long-term, structured volunteering in many parts of the community.

During the 2022 Flood Event, Disaster Relief Australia entered a memorandum of understanding with Emergency Recovery Victoria and Emergency Management Victoria to help coordinate the efforts of hundreds of volunteers, both groups and individuals, who spontaneously offered their services. The primary aim was to facilitate cleaning out and restoration of structures in a safe and controlled manner.

In addition to volunteering, Australians are quick to donate during emergency events. However, emergency services, community groups and impacted people can often be overwhelmed by the task of managing donations and struggle to direct them to where they are most needed. To help overcome this issue, Emergency Recovery Victoria has engaged GIVIT (a not-for-profit organisation) to coordinate the management of donated goods and services by organisations, individuals and businesses. GIVIT provides support, including awareness-raising, to registered organisations, corporations and public donors through its online warehouse platform. The virtual warehouse can accept offers of goods, services or monetary donations and match these with requests for assistance.

12. Definitions

Term	Definition
class 1 emergency	<p>(a) A major fire</p> <p>(b) Any other major emergency for which Fire Rescue Victoria, the Country Fire Authority or the Victoria State Emergency Service Authority is the control agency under the State Emergency Management Plan.</p>
class 2 emergency	<p>A major emergency that is not:</p> <p>(a) a class 1 emergency; or</p> <p>(b) a warlike act or act of terrorism, whether directed at Victoria or a part of Victoria or at any other state or territory of Australia; or</p> <p>(c) a hijack, siege or riot.</p>
class 3 emergency	<p>A security emergency, as defined in the State Emergency Management Plan, that includes a warlike act or act of terrorism, where directed at Victoria or at any other state or territory of Australia, or a hijack, siege or riot.</p>
coordination agency	<p>The agency with primary responsibility for bringing together resources to support mitigation, response to and recovery from emergencies. In addition to coordination agencies, regional and municipal emergency response coordinators perform the coordination role at regional and local government levels.</p>
emergency	<p>As defined in the <i>Emergency Management Act 2013</i>, the word emergency can apply to a range of circumstances, including an emergency due to the actual or imminent occurrence of an event which in any way endangers or threatens to endanger the safety or health of any person in Victoria or which destroys or damages, or threatens to destroy or damage, any property in Victoria or endangers or threatens to endanger the environment or an element of the environment in Victoria including, without limiting the generality of the foregoing:</p> <p>(a) an earthquake, flood, wind storm or other natural event</p> <p>(b) a fire</p> <p>(c) an explosion</p> <p>(d) a road accident or any other accident</p> <p>(e) a plague or an epidemic or contamination</p> <p>(f) a warlike act or act of terrorism, whether directed at Victoria or a part of Victoria or at any other state or territory of Australia</p> <p>(g) a hijack, siege or riot</p> <p>(h) a disruption to an essential service.</p>
emergency management	<p>The arrangements for, or in relation to:</p> <p>(a) mitigation of emergencies</p> <p>(b) response to emergencies</p> <p>(c) recovery from emergencies.</p>

emergency management sector	The sector comprising all agencies, bodies, departments and individuals with a responsibility, function or other role in emergency management.
major emergency	(a) A large or complex emergency (however caused) which: <ul style="list-style-type: none"> (i) has the potential to cause or is causing a loss of life and extensive damage to property, infrastructure or the environment; or (ii) has the potential to have or is having significant adverse consequences for the community or a part of it; or (iii) requires the involvement of two or more agencies to respond; or (b) a class 1 emergency; or (c) a class 2 emergency.
recovery lead agency	Leads the provision of services, personnel and material during the recovery phase of an emergency
relief lead agency	Provides direct relief assistance to individuals, families and communities and/or indirect assistance by re-supplying essential goods or services to isolated communities
support agency	An agency that contributes capability and/ or capacity to an emergency management activity in conjunction with the control and/or coordination agency – across mitigation, response and recovery activities. In the response phase of an emergency, a support agency is the lead agency in a dedicated functional area. When an emergency falls within its functional area, it provides services, personnel and materials to assist with control activities.

13. Abbreviations

ABCB	Australian Building Code Board
ADF	Australian Defence Force
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AIDR	Australian Institute Disaster Resilience
AWS	Australian Warning System
BAU	business as usual
BoM	Bureau of Meteorology
BRV	Bushfire Recovery Victoria
CAD	Computer Aided Dispatch System
CFA	Country Fire Authority
CMA	Catchment Management Authority
CSBA	Community Safety Building Authority
DACC	Defence Assistance to the Civil Community
DEECA	Department of Energy, Environment and Climate Action
DFFH	Department of Families, Fairness and Housing
DH	Department of Health
DJCS	Department of Justice and Community Safety
DJSIR	Department of Jobs, Skills, Industry and Regions
DRFA	Disaster Recovery Funding Arrangements
DTP	Department of Transport and Planning
EM	Emergency Management
EM Act 1986	<i>Emergency Management Act 1986</i>
EM Act 2013	<i>Emergency Management Act 2013</i>
EMC	Emergency Management Commissioner
EM-COP	Emergency Management Common Operating Picture
EMJPIC	Emergency Management Joint Public Information Committee
EMV	Emergency Management Victoria
ERV	Emergency Recovery Victoria
ESO	emergency services organisation

ESTA	Emergency Services Telecommunications Authority
EMJPIC	Emergency Management Joint Public Information Committee
FFMVic	Forest Fire Management Victoria
FMA	Floodplain Management Authorities
FO	flood overlay
FRV	Fire Rescue Victoria
GHG	greenhouse gas
ICC	Incident Control Centre
IEMT	Incident Emergency Management Team
IGEM	Inspector-General for Emergency Management
IMT	Incident Management Team
IOD	Indian Ocean Dipole
IPCC	International Panel on Climate Change
JSOPs	Joint Standard Operating Procedures
LBSWR	land-based swift water rescue
LGA	Local Government Area
LHQ	Local Headquarters
LSIO	Land subject to inundation overlay
LSV	Life Saving Victoria
MAV	Municipal Association of Victoria
MEMP	Municipal Emergency Management Plan
MPS	Melbourne Planning Scheme
MSS	Municipal Strategic Statement
NCC	National Construction Code
NCCMA	North Central Catchment Management Authority
NSW	New South Wales
NWM	North West Metro
PE Act	<i>Planning and Environment Act 1987</i>
REMPC	Regional Emergency Management Planning Committee
REMPs	Regional Emergency Management Plans
RCC	Regional Control Centre
RFA	Request for assistance
RFMS	Regional Floodplain Management Strategies

RRT	Rapid Response Team
RTM&E	Real Time Monitoring and Evaluation
SAM	Southern Annular Mode
SAP	(Emergency Management) Strategic Action Plan
SBO	Special Building Overlay
SCC	State Control Centre
SCRC	State Crisis and Resilience Council
SCT	State Control Teams
SEMP	State Emergency Management Plan
SEMT	State Emergency Management Team
SEWS	Standard Emergency Warning Signal
SLE	State Lesson and Evaluation
SLS	Service Level Specification
SOPs	Standard Operating Procedures
SRC	State Response Controller
TFWS	Total Flood Warning System
UFZ	Urban Floodway Zone
VCAT	Victorian Civil and Administrative Tribunal
VCAT Act	<i>Victorian Civil and Administrative Tribunal Act 1998</i>
VESEP	Victorian Government Volunteer Emergency Services Equipment Program
VFMS	Victorian Floodplain Management Strategy
VICSES	Victoria State Emergency Service
VICSES Act	<i>Victoria State Emergency Service Act 2005</i>
VPP	Victoria Planning Provisions

14. Appendices

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Appendix 1: Breakdown of VICSES revenue 2017–18 to 2021–22

Income from transactions	2017–18 (\$m)	2018–19 (\$m)	2019–20 (\$m)	2020–21 (\$m)	2021–22 (\$m)
Grants					
Department of Justice and Community Safety					
- Operating grant income	53.871	50.792	56.307	57.235	60.972
- Volunteer and other grants	3.297	9.009	2.844	4.553	9.129
- Special appropriation volunteer WorkCover	0.591	0.806	0.625	0.917	0.646
Other State Government entities/agencies					
- Melbourne Water	0.170	0.342	0.350	0.479	0.138
- Department of Environment, Land, Water and Planning ⁹⁸	0.500	0.500	0.500	-	-
- Transport Accident Commission	3.955	3.996	4.038	4.081	4.760
- Emergency Services Telecommunications Authority	-	-	-	-	0.597
- Country Fire Authority	-	0.440	0.451	0.462	0.474
- Other state entities/agencies	0.095	-	-	-	-
Other	0.203	0.180	0.077	0.035	0.076
Sub-total grants revenue	62.682	66.065	65.192	67.762	76.792
Interest income	0.855	1.031	0.306	0.167	0.165
Sale of services	0.061	0.054	0.023	-	-
Fair value of assets received free of charge	-	0.340	1.297	1.918	0.215
Other income⁹⁹	1.290	1.131	1.535	0.870	1.318
TOTAL INCOME FROM TRANSACTIONS	64.888	68.621	68.353	70.717	78.490

Source: VICSES annual reports

⁹⁸ DEECA as of 1 January 2023.

⁹⁹ Sponsorships, donations and other income (including revenue from contracts with customers in accordance with AASB 15).

Appendix 2: Breakdown of VICSES expenses 2017–18 to 2021–22

Expenses from transactions	2017–18 (\$m)	2018–19 (\$m)	2019–20 (\$m)	2020–21 (\$m)	2021–22 (\$m)
Employee expenses	26.880	27.789	29.451	28.366	30.188
Depreciation and amortisation	7.188	7.190	8.669	9.045	10.952
Interest	0.199	0.187	0.534	0.468	0.400
Other operating expenses					
Supplies and services					
- Contractors and professional services	5.017	4.972	4.667	5.819	6.134
- Building service and maintenance expenses	2.431	2.674	1.427	1.609	1.689
- Travel and associated costs	0.716	0.687	0.498	0.540	0.666
- Printing, stationery and other office expenses	0.521	0.675	0.503	0.700	0.446
- Postage and communication expenses (including operational communications)	5.554	5.604	7.918	8.296	8.762
- Vehicle expenses	1.277	1.445	2.152	1.755	1.796
- Technology services costs	4.209	3.730	4.867	4.788	4.918
- Protective clothing	0.853	0.959	1.101	1.374	1.523
- Emergency rescue equipment	2.615	2.139	2.035	2.594	2.198
- Training (volunteers and staff)	1.760	2.412	1.370	1.143	1.606
- Other	0.676	0.770	0.827	1.081	0.493
Short-term and low-value leases	0.046	0.046	0.718	0.526	0.848
Net result of VICSES volunteer units	1.016	1.199	1.710	1.368	1.175
Sub other operating expenses	26.691	27.478	29.793	31.593	32.254
TOTAL EXPENSES FROM TRANSACTIONS	60.958	62.478	68.447	69.472	73.794

Source: VICSES Annual Reports

Appendix 3: VICSES infrastructure projects

Project	Description	Status
Fawkner (Broadmeadows) unit	New facility	In progress
Caroline Springs unit	New facility	In progress
Chelsea unit	New facility	Completed 2023
Clyde unit	New facility	In progress
Cobram unit	New facility	In progress
Corio unit	Facility upgrade	In progress
Craigieburn North/Kalkallo unit	New facility	In progress
Cranbourne unit	New facility	In progress
Emerald unit	New facility	Completed 2021
Essendon unit	Facility upgrade and extension	Completed 2022
Head Office, Southbank	Facility upgrade	Completed 2022
Knox unit	New facility	Completed 2021
Heidelberg (Northcote) unit	New facility	Completed 2022
Officer unit	New facility	In progress
Point Cook unit	New facility	In progress
Point Fairy unit	New facility	In progress
Skye facility – Frankston unit	New satellite facility	In progress
Wangaratta unit	New facility	Completed 2020
Wonthaggi unit	New facility	In progress