North West (Loddon Mallee) Region

Emergency Response Plan

SES

Earthquake Sub Plan

Published by Victoria State Emergency Service

Melbourne, June 2019

This publication is intended to be consistent with the State Emergency Response Plan (SERP), published by Emergency Management Victoria (EMV) in 2016.

Authorised by the Victoria State Emergency Service (VICSES)
168 Sturt Street, Southbank, VIC, 3006.

An electronic version of the plan can be obtained at: ses.vic.gov.au/em-sector/vicses-emergency-plans.

Version Control
North West Loddon Mallee Region Emergency Response Plan – Earthquake Sub-plan
Version 1.0 June 2019

Loddon Mallee Region Emergency Response Plan – Earthquake Sub-plan Certification

The North West (Loddon Mallee) Region Emergency Response Plan – Earthquake Sub-plan deals with response to earthquake incidents within North West (Loddon Mallee) area of responsibility.

The following plan is intended to provide the framework for Loddon Mallee Region to effectively and efficiently respond to future emergencies caused by earthquakes, and will remain current until rescinded by authority of the Victoria State Emergency Service Chief Officer Operations.

_____ Date: 10 October 2019

Tim Wiebusch
Chief Officer Operations

This plan is produced by Victoria State Emergency Service and has been adapted from the SERP – Earthquake Sub-plan. All information contained in this plan was current at time of publication.

VICSES would like to acknowledge the significant contribution of key stakeholders to ensure the content contained within this plan is of a high quality to support response activities.

For further details about this plan, please contact North West (Loddon Mallee) Region:

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State Emergency Management Priorities

The State Emergency Management Priorities are:

- Protection and preservation of life is paramount. This includes:
    - Safety of emergency response personnel.
    - Safety of community members including vulnerable community members and visitors/tourists.
- Issuing of community information and community warnings detailing incident information that is timely, relevant and tailored to assist community members make informed decisions about their safety.
- Protection of critical infrastructure and community assets that support community resilience.
- Protection of residential property as a place of primary residence.
- Protection of assets supporting individual livelihoods and economic production that supports individual and community financial sustainability.
- Protection of environmental and conservation assets that considers the cultural, biodiversity, and social values of the environment.

Table of Contents

1. Introduction

1.1 Purpose

The purpose of this plan is to provide strategic guidance for the effective emergency management of an earthquake in North West (Loddon Mallee) Region.

1.2 Objective

The objective of the North West (Loddon Mallee) Region Emergency Response Plan – Earthquake Sub-plan is to outline the arrangements for ensuring an integrated and coordinated approach to the management of earthquake events in the North West (Loddon Mallee Region), in order to reduce the impact and consequences of these events on the community, infrastructure and services.

1.3 Scope

This South West (Loddon Mallee) Region Emergency Response Plan – Earthquake Sub-plan includes:

- Description of potential risks and consequences of earthquakes to the social, built, economic and natural environments.
- Region specific emergency management arrangements for the management of earthquakes.
- Links to sources of information where the reader can obtain further detail.

1.4 Authorising Environment

The *Emergency Management Act (1986 and 2013)* is the empowering legislation for the management of emergencies in Victoria.

The Emergency Management Manual Victoria (EMMV) contains policy and planning documents for emergency management in Victoria, and provides details about the roles different organisations play in the emergency management arrangements.

The SERP (Part 3, EMMV) identifies Victoria's organisational arrangements for managing the response to emergencies.

The North West (Loddon Mallee) Region Emergency Response Plan (yet to be developed) will detail specific arrangements for the management of emergencies within the North West (Loddon Mallee) Region. This plan has been developed as a subordinate plan of the North West (Loddon Mallee) Region Emergency Response Plan and the SERP – Earthquake Sub-plan. This plan has been shared with the Regional Emergency Management Committee for comment, and approved by the VICSES Chief Officer Operations.

Other relevant legislation includes:

- *Victoria State Emergency Service Act 2005.*
- *Essential Services Act 1958.*
- *Planning and Environment Act 1989.*
- *Local Government Act 1989.*

1.5 Activation of the Plan

The arrangements in this plan apply on a continuing basis and do not require activation.

1.6 Audience

The audience for this plan comprises the Victorian Government and agencies within the emergency management sector, including business and community groups with a significant role in the management of the emergency.

Although the wider community is not the primary audience, community members may find the contents of this plan informative.

1.7 Linkages

This plan is a sub-plan of the SERP – Earthquake Sub-plan and the North West (Loddon Mallee) Region Emergency Response Plan (yet to be developed). It reflects legislation, the arrangements in the SERP, the strategic direction for emergency management in Victoria and the accepted State practice for managing emergencies.

Arrangements in this plan have not been repeated from afore mentioned plans, unless necessary to ensure context and readability. The SERP – Earthquake Sub-plan can be accessed at www.ses.vic.gov.au

Arrangements for the management of secondary consequences are contained in the following:

- For health response – State Health Emergency Response Plan (SHERP).
- For rescue – the Victorian Urban Search and Rescue Response (USAR) Arrangement.
- Flood response resulting from dam failure – State Emergency Response Plan – Flood Sub-plan, and North West (Loddon Mallee) Emergency Response Plan Flood Sub-plan.

1.8 Exercising and Evaluation

This plan will be exercised within one year from the date of approval and once every three years thereafter as part of a phased cycle. A Region Earthquake Scenario has been created to support this function available in Attachment 1 – Region Earthquake Scenario. The exercise will be evaluated and, where improvements to the emergency management arrangements in this plan are required, the plan will be amended and a revised version issued. Exercises will be conducted in accordance with the State Exercising Framework.

Any operational activity in the North West (Loddon Mallee) Region requiring the management of an earthquake event will be regarded as exercising of the plan. The event is to be evaluated and reviewed, as outlined above.

1.9 Review

This plan was current at the time of publication and remains in effect until modified, superseded or withdrawn.

This plan will be reviewed and updated every three years. Consideration will be given to an earlier revision if the plan has been applied in a major emergency or exercise, or following a substantial change to the relevant legislation or arrangements.

2. The Earthquake Risk within the Loddon Mallee Region

2.1 Region Description

The North West (Loddon Mallee) Region of Victoria covers 59,000 square kilometres, occupying more than one quarter of the area of Victoria. The region borders the states of South Australia and New South Wales.

The regions 10 municipalities include Macedon ranges, Mount Alexander, Central Goldfields, Greater Bendigo, Campaspe, Loddon, Gannawarra, Buloke, Swan Hill and Mildura. Municipal boundaries are accessible via the Emergency Management – Common Operating Picture (EM-COP) for registered users at https://cop.em.vic.gov.au

Geographically this is a diverse region, including numerous towns and cities of varying sizes. The largest centres in the region are Bendigo with a population of 110,000, and Mildura with a population of 54,000. In total, the region has a population of around 332,000, 4.5% of which originate from non-English speaking countries.

North West (Loddon Mallee) Region encompasses a number of culturally sensitive sites, particularly along the Murray River, and a significant number of National and State parks. A number of major rivers, highways, roads and rail systems also run throughout the region. An increasing number of people in the south of the region work in the capital of Victoria, Melbourne, and commute daily via these road and rail systems.

The northern part of the region encompasses significant areas of horticulture, viticulture, agriculture, dry land farming, mining infrastructure, wine and table grape production and stone fruit production. This area is also included as part of the Murray Darling Basin Authority.

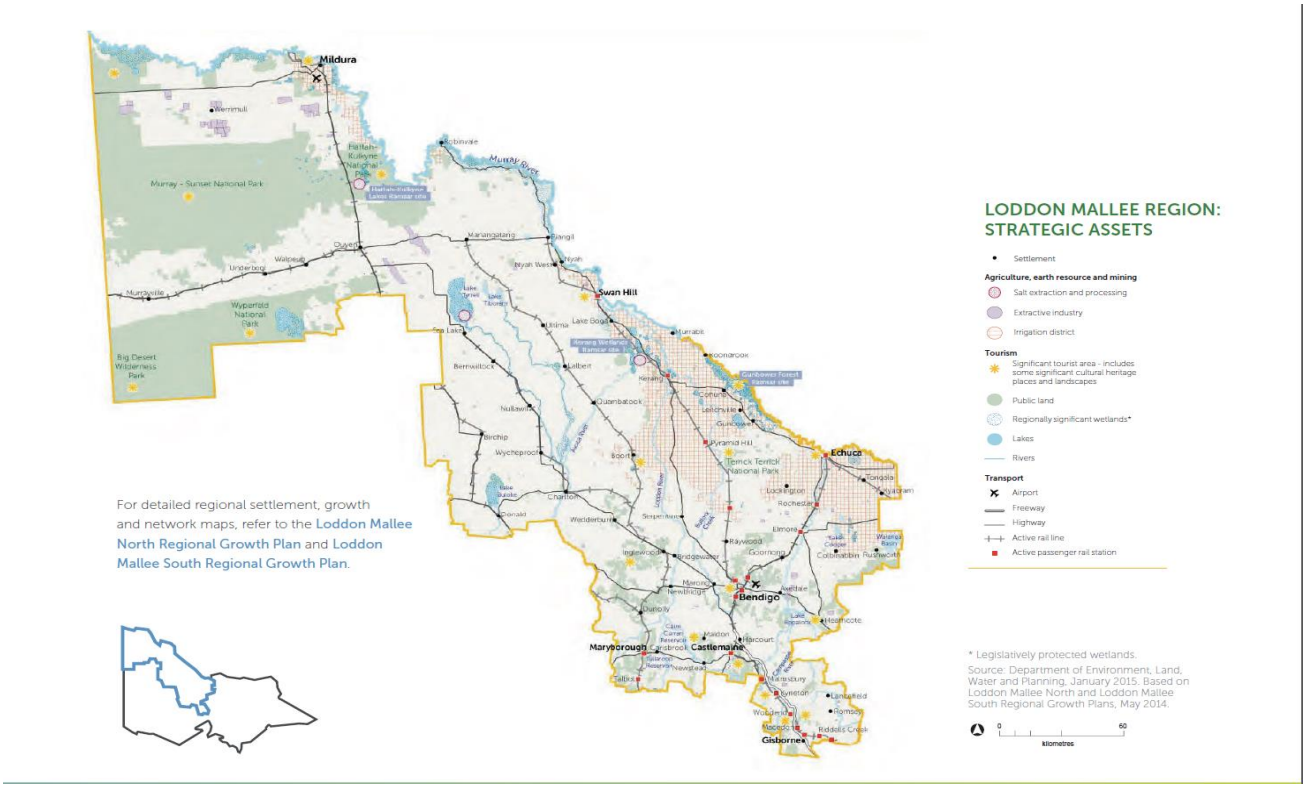


Figure 1 – Map of Loddon Mallee Region (Source: Regional Development Victoria).

2.2 The Earthquake Hazard

An earthquake is the shaking and vibration at the surface of the Earth caused by energy being released along a fault plane, at the edge of a tectonic plate or by volcanic activity. Earthquakes, unlike many other natural hazards, have the potential to cause catastrophic losses. Although Australia is popularly considered to have a low earthquake risk, a major earthquake could still occur under a heavily developed and populated area in Victoria. The impact of such an earthquake could have widespread consequences throughout the relevant township and surrounds. Whilst there is a low probability that this event will occur in the foreseeable future, it is important to recognise the potential for such catastrophic impacts.

Victoria is located away from geologically-active tectonic plate boundaries, which lay hundreds of kilometres seaward of the eastern coastline. However, Victoria regularly experiences small earthquakes that are felt and reported. Stresses and strains develop in the Indo-Australian plate (of which Australia is a part) as it drifts northward; as sediment loads continually transfer from upper catchment areas to lower basins and coastal areas due to erosion; and as fluctuating sea levels load and unload the continental shelf.

The size of an earthquake is referred to as its magnitude (M). For every unit increase in magnitude, there is roughly a thirty-fold increase in the energy released. For instance, a magnitude 2.0 earthquake (M 2.0) releases about 30 times more energy than a magnitude 1.0 earthquake (M 1.0), while a magnitude 3.0 earthquake (M 3.0) releases 900 times (30x30) more energy than a magnitude 1.0 (M 1.0).

In Australia, seismologists (people who study earthquakes) prefer the use of the moment magnitude scale, which calculates the magnitude of an earthquake based on physical properties such as the area of movement (slip) along the fault plane.

A M 6.0 earthquake can be anticipated for all of Australia, on average, every five years and a M 5.0 earthquake once per year. The probable maximum earthquake magnitude for Australia is approximately M 7.5.

Australia is not immune from damaging earthquakes causing significant human and economic loss, as shown in the list below:

- In July 1903, a M 5.3 earthquake caused extensive minor damage in Warrnambool, Victoria.
- In 1932, a M 4.5 event caused considerable damage on the Mornington Peninsula.
- In 1996 a M 5.2 earthquake was centred near Mt Baw Baw, the shock was felt up to 100km away with minor damage reported in Melbourne.
- In August 2000, a M 5.0 earthquake in Boolarra caused minor damage and was felt throughout Gippsland.
- In 2009, Korumburra experienced two earthquakes within two weeks of each other on 6 March and then 18 March. Both earthquakes were recorded at M 4.6.
- In June 2012, a M 5.3 earthquake occurred in the La Trobe Valley, Gippsland. The earthquake caused minor damage. The earthquake epicentre was 16 kilometres southwest of Moe and was the strongest earthquake recorded since the 1982 Wonnangatta Valley earthquake. It was felt across the state including in Melbourne and as far away as Wodonga.

In Victoria a number of earthquakes have occurred resulting in damage and even death. A list of significant earthquake events that have impacted Victoria and their associated impacts is included in the SERP – Earthquake Sub-plan.

The North West (Loddon Mallee) Region has not experienced any significant earthquakes (magnitude 3 or above).

2.3 Major Dams with Credible Earthquake Risk

A list and description of major dams within the region is contained below. These dams are not known to be susceptible to earthquakes, and are listed for awareness only.

Dam name	Location	Capacity (Megalitres)
Laanecoorie Reservoir	Located on the Loddon River, 40km south-west of Bendigo.	8,000Ml
Cairn Curran Reservoir	Located on the Loddon River, about 10km west of Maldon.	147,130Ml
Lake Eppalock	Located on the Campaspe River, near Bendigo in central Victoria.	276,751Ml (304651Ml on Goulbourn Murray Water website)
Barkers Creek Reservoir	25km south of Bendigo, north of Harcourt.	1,690Ml
Caledonia Reservoir	6km south of Heathcote \on Dairy Flat Rd.	214Ml
Upper Coliban Reservoir	Located 9km west of Kyneton on the Coliban River.	37,770Ml (from Coliban Water website)
Lauriston Reservoir	Located 8km south west of Kyneton on the Coliban River.	19,790Ml (from Coliban Water website)
Malmsbury Reservoir	Located 1km south Malmsbury on the Coliban River.	12,034Ml (from Coliban Water website)
McCay Reservoir	Located off the Pyrenees Highway, halfway between Chewton and Elphinstone townships.	1,400Ml
Sandhurst Reservoir	Located at Big Hill, 3km south of Kangaroo Flat.	2,600Ml
Spring Gully Reservoir	Located in Spring Gully, 3km south of Bendigo.	1,680Ml
Expedition Pass Reservoir (Golden Point Reservoir)	Located on Golden Point Road, around 3km from Chewton.	264Ml
Torrumbarry Weir	Located 30km north of Echuca.	36,810Ml
Crusoe Reservoir	Located upstream of Kangaroo Flat off Crusoe Road.	890Ml
Tullaroop Reservoir	Located 6km upstream of Carisbrook off Rodborough Road.	72,950Ml (from the Goulbourn Murray Water website)
Mildura Weir	North east corner of the Mildura township, on Murray River	36,600Ml (from GMW website)
Waranga Basin	East of Rushworth township.	432,360Ml (from the Goulbourn Murray Water website)
Campaspe Weir	South West of Rochester township on the Northern Highway.	252,000Ml (from Goulbourn Murray Water website)

Note: Most dam safety emergency plans can be located in EM-COP or via the VICSES North West Regional Duty Officer (Bendigo Office Library).

2.4 Regional Resources

Key regional resources that are used for earthquake response include:

- 280 (approx.) Category 1 USAR personnel trained from SES.
- 220 Category 2 USAR personnel from SES MFB and CFA.
- 20 (approx.) Category 2 USAR trained Ambulance Victoria paramedics.
- U/K numbers of Category 2 USAR trained VICPOL Search and Rescue personnel.
- VICPOL Canine Unit personnel and dogs.
- MFB USAR pod.
- MFB Heavy Rescue pod.
- MFB High Angle Rescue Team (HART) pod.
- 2 x MFB Heavy Rescue Caches (technical search, UAV, Damage Assessment).
- CFA Technical Rescue pod – Trench Rescue.
- CFA Technical Rescue pod – Medium Angle Rescue.

Expert multi-agency recourses may be accessed during operations through the Australasian Inter-Service Incident Management System (AIIMS) structure.

Further regional recourses are available in Attachment 3 – Regional Resource List.

This information is also accessible via EM-COP for registered users.

3. Consequences

3.1 Possible Earthquake Consequences

The effects of an earthquake depend on many factors, such as the magnitude of the earthquake, its depth and the distance from the epicentre. The below summarises the possible types of damage and disruption that may result in a major earthquake. Detailed information about the effect of earthquakes is contained in the SERP – Earthquake Sub-plan.

Built infrastructure damage (e.g. buildings) – Information on building critical infrastructure resilience can be found in the Victorian Critical Infrastructure Resilience Strategy available at www.emv.vic.gov.au/our-work/critical-infrastructure-resilience

Casualties – Casualties and injuries are likely to result from large damaging earthquakes. People may also become trapped requiring rescue. Secondary public health impacts may occur if essential services are not readily available after the impact of an earthquake.

Displacement and isolation – As a consequence of damage, people can become displaced requiring temporary accommodation. Areas can become isolated requiring resupply of essential items.

Transport Access – Roads may be blocked as a consequence of debris from fallen buildings. Thereby, limiting the movement of produce to some communities, with stock and grain requiring access to export ports also limited. Emergency services may be inhibited from responding to incidents. Community services may be brought to a standstill.

Trams and trains – Some rail and light rail bridges may be extensively damaged. Thereby limiting the movement of people and grain to export ports

Electricity – The complete failure of large power components, such as transformers or substations, may occur in the proximity of the epicentre.

Water supply – Major water facilities such as pumping stations and reservoirs may experience damage. Damage may occur across the network. In case of liquefaction, breakage of pipes is likely to be widespread and concerns over contamination may render the water not suitable to drinking.

Waste water – Extensive damage may occur to waste water systems can occur even without the occurrence of liquefaction.

Communications – Communications infrastructure may suffer damage and be overloaded. Loss of communication can be due to a variety of reasons such as the crashing of telecommunication services, website crashes, and loss of power meaning mobile phones cannot be charged or cordless home phones will not work.

Chemical and high risk industrial plants – It is expected that high risk facilities will be designed for increased resilience to earthquake damage, thus the probability of an accident induced by an earthquake is classified as low.

Hazardous material release – Hazardous materials are not exclusive to heavy industry and may be released as a consequence of building collapse. These may include carcinogenic or corrosive gases, poisonous liquids that contaminate the water table. Asbestos may be exposed as a result of earthquake building damage.

Fire following earthquake – Fire following earthquake will likely be localised to high risk sites such as industry.

Long series of aftershocks – A series of aftershocks are possible after an earthquake event and may result in increased damage levels as well as seriously disrupting recovery activities.

Other impacts – Consideration should also be given to: land or mud slide, tsunami, floods from dam and levee failure and subsidence.

3.2 Earthquake History

The figures below provide information regarding the locations of earthquake in the region dating back to 1900.

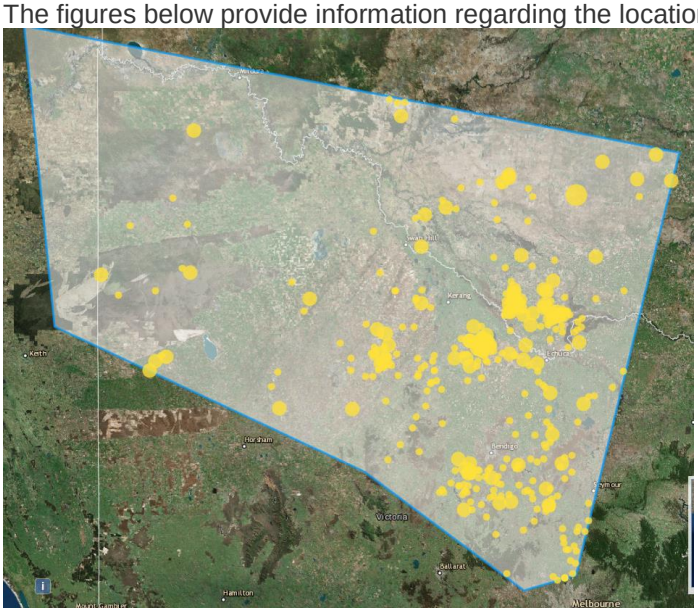


Figure 3.1 All recorded earthquakes in the general North West (Loddon Mallee) Region from 1900-2019 (the size of the circle indicates magnitude) (Source: Geoscience Australia @ www.ga.gov.au).

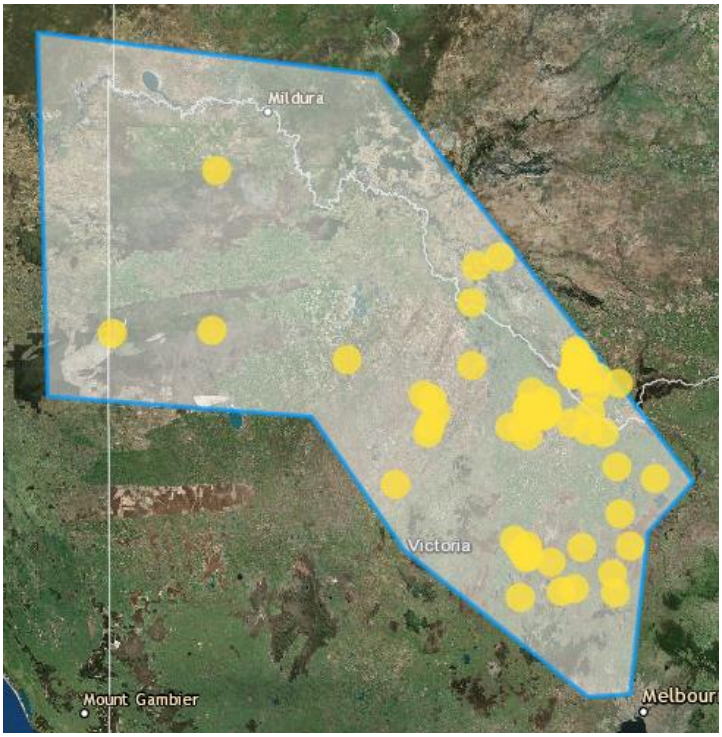


Figure 3.2 – Earthquake magnitude 3 and above recorded in the general North West (Loddon Mallee) Region from 1900-2019 (Source: Geoscience Australia @ www.ga.gov.au).

The table below provides information on the historical occurrence of earthquakes within the North West (Loddon Mallee) Region (magnitude 3 and above). Refer to SERP – Earthquake Sub-plan (pp.6-7) for examples and/or Geoscience Australia's Earthquake Database at http://www.ga.gov.au/earthquakes/searchQuake.do.

Date	Depth in kms	Location	Damage	Magnitude
24/08/1974	0	Pyramid Hill, Victoria.	Nil reported	3.8
24/04/1986	13	Near Glenloth, Victoria.	Nil reported.	4
11/07/1969	0	Near Shelbourne, Victoria.	Nil reported.	4
10/04/1961	0	Near Newstead, Victoria.	Nil reported.	4
6/04/1957	0	Near Dumosa, Victoria.	Nil reported.	4
15/01/1965	0	Near Dumosa, Victoria.	Nil reported.	4
3/07/1988	10	Near Perricoota, New South Wales.	Nil reported.	4
10/04/1986	13	Near Mathoura, New South Wales.	Nil reported.	4.2
27/12/1980	0	Near Bael Bael, Victoria.	Nil reported.	4.2
8/02/1971	22	Near Barmah, Victoria.	Nil reported.	4.3
27/10/2001	16.5	Swan Hill, Victoria.	Minor damage, with some chimneys toppled.	4.8

4. Community Resilience

4.1 Shared and Individual Responsibility for Action

The National Strategy for Disaster Resilience, developed by the Council of Australian Governments (COAG), provides high-level guidance on disaster management to agencies with a role in emergency management.

Foremost in the strategy is the principle of all of society taking responsibility for preparing for disasters. Examples in the context of earthquake include:

- Individuals being aware of their earthquake risk, and following advice from emergency services when responding to warnings.
- Local governments and communities including earthquake risk within their Community Emergency Risk Assessment activities, including consideration within emergency management planning and land use planning.
- Industry and businesses planning for the risk of disruption, and ensuring arrangements are in place to maintain critical services, and assist communities where possible.

Government agencies undertaking:

- Risk assessments to gain an appreciation of earthquake risk.
- Engaging with the community regarding earthquake risk.
- Working with communities to plan the management of earthquake risk.
- Providing emergency information and earthquake warnings.
- Ensuring an effective, well-coordinated response to an earthquake event.
- Helping communities to recover and learn following an earthquake and build their resilience to future events.

VICSES has developed a Community Resilience Strategy and delivers programs to at-risk communities to provide information on what to do before, during and after earthquakes. Information can be found at www.ses.vic.gov.au/get-ready.

4.2 Earthquake Notifications

Earthquake notifications are provided by Geoscience Australia, who analyse and report on earthquakes within Australia and internationally. This is done on a 24/7 basis by Duty Seismologists for the purposes of earthquake warnings and to alert governments, emergency services and the general public of earthquakes in Australia and overseas.

There is no accepted method to predict earthquakes; however, some regions are more prone to earthquakes than others due to their location in proximately to earthquake faults. When an earthquake occurs, Geoscience Australia and VICSES will work together to notify the community.

Geoscience Australia monitors seismic data from the Australian National Seismic Network and stations worldwide. This is done in near real-time, 24 hours a day. Seismic data is also freely provided by overseas governments who have national seismic networks. Geoscience Australia uses data provided by the Governments of New Zealand, Indonesia, Malaysia, Singapore and China. Data from global seismic networks are also provided by USA, Japan, Germany and France.

The seismic data is collected and analysed automatically and then immediately reviewed by Geoscience Australia's Duty Seismologist. For earthquakes that have the potential to generate a tsunami, preliminary

earthquake details are computed within 15 minutes. All other earthquakes are generally computed within 30 minutes.

Earthquakes that can be located in Australia are catalogued and published on the Geoscience Australia website. The analysis includes the origin time and date of the earthquake, its location (latitude, longitude and depth) and its magnitude. Earthquakes outside Australia, but within our region, are published only for earthquakes with a magnitude of 5 or greater. Earthquakes occurring anywhere internationally with a magnitude of 6 or greater are also catalogued and published on the Geoscience Australia website at www.ga.gov.au/earthquakes/.

4.3 Building Codes

Australia's building codes set out data and procedures for determining earthquake loads on structures and their components, whilst detailing minimum requirements for structures. Local government is responsible for the application of building code provisions.

4.4 Municipal Storm Emergency Planning

Where earthquake is identified through the emergency risk management process as a priority risk to a community, VICSES will provide advice and support to the Municipal Emergency Management Planning Committee (MEMPC) to ensure the Municipal Emergency Management Plan (MEMP) contains, at a minimum, arrangements for the response to an earthquake event based on all-hazards and all-agency response.

4.5 Community Engagement

Community engagement programs to build community resilience for earthquakes are conducted in accordance with the VICSES Community Resilience Strategy, as outlined in section 4.1 Shared and Individual Responsibility for Action.

Programs to build resilience in North West (Loddon Mallee) Region include local engagement activities and initiatives. For community information regarding earthquakes visit www.ses.vic.gov.au/get-ready/quakesafe.

4.6 Household and Business Plans

The Emergency Management Commissioner advises that every household and business should have a written emergency plan. Information on the development of these plans can be found at www.ses.vic.gov.au.

The North West (Loddon Mallee) Region also supports local caravan owners prepare for emergencies by supporting use of the online planning tool, which can be found at www.ses.vic.gov.au/get-ready/caravan-park-information.

4.7 Community Safety Advice

VICSES provides advice to the community in the form of key safety messages for earthquake, including advice for safe evacuation. A full list of community safety advice messages can be viewed online via EM-COP, located in the IMT Toolbox.

5. Managing an Earthquake Event

5.1 Roles and Responsibilities

Roles and responsibilities of agencies involved in responding to earthquakes are detailed in the SERP – Earthquake Sub-plan.

5.2 Concept of Operations

The concept of operations is detailed in the SERP – Earthquake Sub-plan.

Further information is also contained in VICSES Operations Management Manual V4 – July 2018.

5.3 Escalation and Notification

Geoscience Australia publishes any earthquake activity, as detailed in section 4.2 Earthquake Notifications, on their public website www.ga.gov.au/earthquakes/ and notifies pre-identified agencies, organisations and media outlets, including pager and email notification messages to the VICES State Duty Officer (SDO).

The VICSES SDO will acknowledge any Earthquake Notification, confirm details with Geoscience Australia and notify relevant internal personnel, including Regional Duty Officers (RDOs).

Upon receipt of an Earthquake Notification, RDOs will acknowledge the pager message and notify the Regional Agency Commander (RAC) to notify the Regional Controller and/or Regional Emergency Management Team members for earthquake response, and any relevant Units.

The escalation and notification process for earthquake response is operationalised within the VICSES Standard Operating Procedure (SOP) 046 – Earthquake Notification and Activation Process.

5.4 Strategic Response Planning

The actions listed below are the responsibility of VICSES at the regional and State tiers. Responsibility for these actions may transition to the Regional Controller to support multi-agency response when significant impacts caused by an earthquake event occur.

On receipt of an Earthquake Notification the RAC will undertake strategic level planning. Key considerations will include:

- Establishing the control structure for managing the event.
- Supporting consistent emergency warnings and provision of information to the community.
- Implementation of evacuation and emergency relief plans and identification of evacuation points.
- Confirming agencies at all tiers are activated and appropriate arrangements are in place.
- Identifying the likely consequences of the earthquake and any interdependencies that may affect planning.
- Confirming agencies have adequate resources in place to fulfil their responsibilities and are planning for sustainment and surge capacity, including identification of need for inter-state or international assistance.
- Identifying mass gatherings and large public events that maybe at risk, and arrangements to ensure the safety of individuals attending.
- Confirming agencies with call-taking responsibilities have resources in place and back up arrangements to cope with the expected call load.
- Positioning of Emergency Management Liaison Officers (EMLOs) from key support agencies to Regional Control Centres (RCCs), where appropriate.
- Arranging for regular meetings of the Regional Emergency Management Teams (REMTs) and Incident Emergency Management Teams (IEMTs).
- Providing situation reports to the State Control Team (SCT).

5.5 Cross Border Arrangements

The North West (Loddon Mallee) Region cross border arrangements exists with the New South Wales State Emergency Service (NSW SES) and the South Australian State Emergency Service (SA SES). This is supported by a Memorandum of Understanding (MOU) that outlines how VICSES will request assistance from NSW SES or SA SES.

- In the case of an event within the immediate border area the VICSES Assistant Chief Officer or delegate will request from the NSW SES Murray Regional Controller or the SA SES Murraylands Controller, or delegate such support as is immediately required and notify the VICSES State Duty Officer (SDO).
- In the case of an event within Victoria but outside the immediate border area, the request will be escalated to VICSES Chief Officer Operations or delegate.

Interstate arrangements exist with the neighbouring states including New South Wales and South Australia. These arrangements can be found at https://cop.em.vic.gov.au – under the Library Tab.

During a significant earthquake event additional units may be deployed to neighbouring regions, with reciprocal arrangements for units deployed to support the North West (Loddon Mallee) Region.

5.6 Regional Control Centre

The following pre-determined facilitates are suitable for the establishment of a RCC for the management of flood events.

North West (Loddon Mallee) Regional Control Centre
Valentines Walk
Bendigo, VIC, 3550

The RCC backup facility is located at:

VICSES Bendigo Regional Office
7 Rohs Road,
East Bendigo, VIC, 3550

A map of RCC footprints can be viewed in EM-Cop/ Situation Tab/Data/Boundaries/Emergency Services/Victorian EM Regions.

5.7 Incident Control Centres

Incident Control Centre (ICC) locations that have been pre-determined for earthquake response are detailed in the table below.

Location	Agency	Local Government Areas within footprint
Department Environment Land Water and Planning (DELWP) offices Level three Thirteenth Street, Irymple Mildura VIC 3500	DELWP	Campaspe Shire Gannawarra Shire Swan Hill Rural City Council Mildura Rural City Council

DELWP offices Level three Calder Highway, Epsom VIC 3551	DELWP	Buloke Shire Macedon Ranges Shire Council Greater City of Bendigo Mt Alexander Shire Council Central Goldfields Loddon Shire Gannawarra Shire

A map of ICC footprints is available in EM-COP at Situation>Tab>Data>Boundaries>Emergency Services>ICC Footprints, or JSOP - J02.03.

5.8 Divisional Command Points

Facilities suitable for use as Divisional Command Points (DCPs) are listed in the table below.

Location	VICSES units within footprint	Local Government Area
Bendigo (VICSES)	Bendigo/ Marong/ Wedderburn	Bendigo
Swan Hill (VICSES)	Swan Hill/ Robinvale	Swan Hill
Wycheproof (VICSES/CFA)	Wycheproof/ Birchip/ Woomelang (St Arnaud, Mid West Region)	Buloke
Mildura (VICSES)	Mildura/ Ouyen/ Murrayville	Mildura
Castlemaine (CFA)	Castlemaine	Castlemaine
Maryborough (DELWP/CFA)	Maryborough/ Dunolly	Central Goldfields
Kyneton (CFA)	Woodend	Macedon Ranges
Kerang (CFA)	Kerang	Gannawarra
Echuca (CFA)	Echuca/ Rochester/ Kyabram/ Rushworth/ Echuca Moama SRS	Campaspe
Gisborne (CFA)	Gisborne	Macedon Ranges
Pyramid Hill (CFA)		Loddon

5.9 Regional Resource Requirements

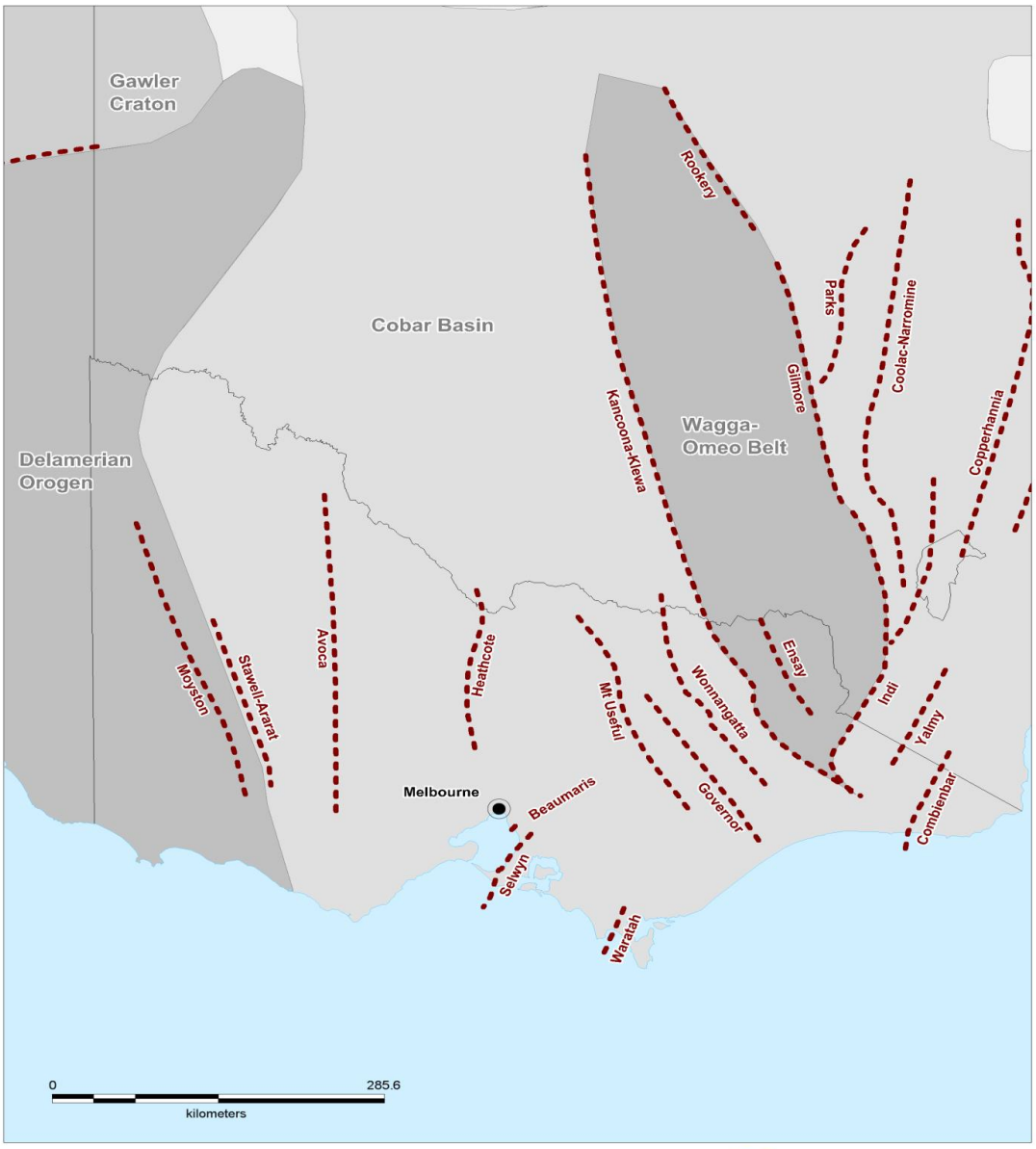
Likely resource requirements for responding to an earthquake event within ICC footprints are detailed in Attachment 3 – Region Resource List.

Glossary

CFA	Country Fire Authority
DCP	Divisional Command Point
DELWP	Department Environment, Land, Water and Planning
DHHS	Department of Health and Human Services
EM-COP	Emergency Management – Common Operating Picture
EMLO	Emergency Management Liaison Officer
EMMV	Emergency Management Manual Victoria
EMV	Emergency Management Victoria
ICC	Incident Control Centre
IEMT	Incident Emergency Management Team
JSOP	Joint Standard Operating Procedure
M	Magnitude
MEMP	Municipal Emergency Management Plan
MEMPC	Municipal Emergency Management Planning Committee
NSW SES	New South Wales State Emergency Service
RAC	Regional Agency Commander
RC	Regional Controller
RCC	Regional Control Centre
RDO	Regional Duty Officer
REMT	Regional Emergency Management Team
SA SES	South Australia State Emergency Service
SCT	State Control Team
SDO	State Duty Officer
SERP	State Emergency Response Plan
USAR	Urban Search and Rescue
VICSES	Victoria State Emergency Service

Attachments

Attachment 1 – South East Australian Faults and Fault Lines



Faults & Fault Lines

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Attachment 2 – North West (Loddon Mallee) Region Earthquake Scenario

A North West (Loddon Mallee) Region Earthquake Scenario has been developed to support periodic training requirements (outlined in section 1.8), provide opportunity to document anecdotal and/or known earthquake impacts based on historic events, and provide an indication of the resource requirements and associated gaps for operational response.

The below scenario is based on a likely earthquake scenario in the North West (Loddon Mallee) Region.

Earthquake Scenario – Shelbourne Shaker

The following is based on an appreciation of historical events which have occurred in the North West (Loddon Mallee) Region and represents a realistic scenario in terms the type and location.

On 11 July at 0621 hours a magnitude 5.1 earthquake occurred near Shelbourne in Victoria, approximately 25km south west of Bendigo (Lat -36.830, Lon 144.100).

This earthquake was felt up to 80kms away, including the towns of Maryborough, Wedderburn, Avoca, Rochester, Heathcote and Kyneton.

A number of properties in the direct area have been affected. At this stage, the full extent of impacts are unknown. However, a number of older buildings in the centre of Bendigo, especially those that were constructed in the late 1800's and early 1900's, have suffered damaged.

Typical affects could include: Try to be specific on what assets we may be concerned about, e.g.; a power plant, a particular caravan park that is on a fault line, major businesses that could be affected and the flow on effects.

Lower end event:

- May be felt, causing some alarm to people and animals.
- May cause unsteadiness when walking.
- Some slight damage to masonry.
- Some plaster cracks or falls.
- Possibility of isolated cases of chimney damage.
- Windows and crockery broken.
- Objects falling from shelves and pictures from walls.
- Trees and bushes shaken, or are heard to rustle.
- Material may be dislodged from existing slips, talus slopes, or slides.

Higher end event:

- Difficulty standing.
- Noticed by drivers of motorcars.
- Trees and bushes strongly shaken.
- Large bells ring (school, church etc.).

- Masonry cracked and damaged.
- Loose brickwork and tiles dislodged.
- Stone walls crack and weak chimneys break.
- Domestic water tanks burst.
- Concrete irrigation ditches damaged.
- Slips and caving-in of sand and gravel banks.
- Waves seen on ponds and lakes.

Magnitude	MM Intensity
< 1.2	I
1.2	II
2.0	III
3.0	IV
4.0	V-VI
5.0	VI-VII
6.0	VII-VIII
7.0	VIII-IX
> 7.0	X-XII

Figure 1 – Modified Mercalli Scale – Earthquake intensity[1].

[1] Source: Geoscience Australia website

MM Intensity	Human Observation
I	Not felt by humans, except in especially favourable circumstances, but birds and animals may be disturbed. Reported mainly from the upper floors of buildings more than ten storeys high. Dizziness or nausea may be experienced. Branches of trees, chandeliers, doors, and other suspended systems of long natural period may be seen to move slowly. Water in ponds, lakes, reservoirs, etc., may be set into seiche oscillation.
II	Felt by a few persons at rest indoors, especially by those on upper floors or otherwise favourably placed. The long-period effects listed under MMI may be more noticeable.
III	Felt indoors, but not identified as an earthquake by everyone. Vibrations may be likened to the passing of light traffic. It may be possible to estimate the duration, but not the direction. Hanging objects may swing slightly. Standing motorcars may rock slightly.
IV	Generally noticed indoors, but not outside. Very light sleepers may be awakened. Vibration may be likened to the passing of heavy traffic, or to the jolt of a heavy object falling or striking the building. Walls and frame of building are heard to creak. Doors and windows rattle. Glassware and crockery rattle. Liquids in open vessels may be slightly disturbed. Standing motorcars may rock, and the shock can be felt by their occupants.
V	Generally felt outside, and by almost everyone indoors. Most sleepers awakened. A few people frightened. Direction of motion can be estimated. Small unstable objects are displaced or upset. Some glassware and crockery may be broken. Some windows crack. A few earthenware toilet fixtures crack. Hanging pictures move. Doors and shutters swing. Pendulum clocks stop, start, or change rate.
VI	Felt by all. People and animals alarmed. Many run outside. Difficulty experienced in walking steadily. Slight damage to masonry D. Some plaster cracks or falls. Isolated cases of chimney damage. Windows and crockery broken. Objects fall from shelves, and pictures from walls. Heavy furniture moves. Unstable furniture overturns. Small school bells ring. Trees and bushes shake, or are heard to rustle. Material may be dislodged from existing slips, talus slopes, or slides.
VII	eneral alarm. Difficulty experienced in standing. Noticed by drivers of motorcars. Trees and bushes strongly shaken. Large bells ring. Masonry D cracked and damaged. A few instances of damage to Masonry C. Loose brickwork and tiles dislodged. Unbraced parapets and architectural ornaments may fall. Stone walls crack. Weak chimneys break, usually at the roof-line. Domestic water tanks burst. Concrete irrigation ditches damaged. Waves seen on ponds and lakes. Water made turbid by stirred-up mud. Small slips, and caving-in of sand and gravel banks.
VIII	Alarm may approach panic. Steering of motor cars affected. Masonry C damaged, with partial collapse. Masonry B damaged in some cases. Masonry A undamaged. Chimneys, factory stacks, monuments, towers, and elevated tanks twisted or brought down. Panel walls thrown out of frame structures. Some brick veneers damaged. Decayed wooden piles break. Frame houses not secured to the foundation may move. Cracks appear on steep slopes and in wet ground. Landslips in roadside cuttings and unsupported excavations. Some tree branches may be broken off.
IX	General panic. Masonry D destroyed. Masonry C heavily damaged, sometimes collapsing completely. Masonry B seriously damaged. Frame structures racked and distorted. Damage to foundations general. Frame houses not secured to the foundations shift off. Brick veneers fall and expose frames. Cracking of the ground conspicuous. Minor damage to paths and roadways. Sand and mud ejected in alluviated areas, with the formation of earthquake fountains and sand craters. Underground pipes broken. Serious damage to reservoirs.

Figure 2 – Description of potential impact.

Categories of non-wooden construction

Category	Construction
Masonry A	Structures designed to resist lateral forces of about 0.1g, such as those satisfying the New Zealand Model Building By-law, 1955. Typical buildings of this kind are well reinforced by means of steel or ferro-concrete bands, or are wholly of ferro-concrete construction. All mortar is of good quality and the design and workmanship are good. Few buildings erected prior to 1935 can be regarded as Masonry A.
Masonry B	Reinforced buildings of good workmanship and with sound mortar, but not designed in detail to resist lateral forces.
Masonry C	Buildings of ordinary workmanship, with mortar of average quality. No extreme weakness, such as inadequate bonding of the corners, but neither designed nor reinforced to resist lateral forces.
Masonry D	Buildings with low standards of workmanship, poor mortar, or constructed of weak materials like mud brick and rammed earth. Weak horizontally.

Figure 3 – Construction categories.

Resource Requirements

The below resource requirements have been identified based on the included earthquake scenario resulting in impacts across the City of Greater Bendigo and impacting approximately 140,000 people across the wider Bendigo region. The response to the event which the scenario is based upon could last for approximately up to five days, with ongoing longer repairs to buildings etc. At the peak of the event thousands of people and properties may be threatened with minor to moderate damage.

Core Capability	Human Resources	Equipment
CFA	Chainsaw operators Sandbag crews Ground observers/Initial Impact Assessment IMT roles	Ladder Platform – specialist access
DELWP	Chainsaw operators/tree fellers Sandbag crews IMT roles	
DHHS	Recovery Personnel	
Local government	Chainsaw operators Arborists Relief and recovery staff Traffic management	Heavy plant
Victoria Police	Traffic management Evacuation management	
Regional Roads Victoria	Chainsaw operators Arborists Traffic management	

Resources listed are those that would be required at the peak of an event, and would represent the resources of all agencies with responsibilities under the SERP – Earthquake Sub-plan.

VICSES resources are listed in Attachment 3.

- Identified RCC established for response can be found in Part 5.6, page 18.
- Identified ICCs established for response can be found in Part 5.7 page 18.
- Identified Divisional Command locations can be found in Part 5.8 page 18.

Attachment 3 – Regional Resource List

The list below contains details of major regional resources that may be used during a flood operation and is supplementary to unit response resources.

- 1 x Field operations vehicle.
- 4 x Incident Agency Commander/EMLO IT kits.
- 1 x Logistics truck (with staging area management equipment).
- 13 x Lighting towers.
- 1 x Sandbag filling trailer.
- Land Based Swift Water Rescue team/s.
- 13 x Rescue boats are situated at the following locations:
    - Mildura
    - Robinvale
    - Swan Hill
    - Kerang
    - Echuca
    - Rushworth
    - Kyabram
    - Rochester
    - Marong

DELWP and CFA maintain specialist resources that are able to be utilised by VICSES during a flood operation, including:

- IMT personnel.
- Chainsaw crews.
- Health monitoring units.
- Initial Impact Assessment teams.