

North East (Hume) Region Emergency Response Plan



Flood Sub Plan

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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, 168 Sturt Street, Southbank, VIC, 3006.

An electronic version of the plan can be obtained at: www.ses.vic.gov.au

Version Control

North East (Hume) Region

Emergency Response Plan – Flood Sub-plan

Version 1.3, May 2018

Final Edit

North East (Hume) Region Emergency Response Plan – Flood Sub-plan Certification

The North East (Hume) Region Emergency Response Plan – Flood Sub-plan deals with response to flood incidents within North East (Hume) area of responsibility.

The following plan is intended to provide the framework for North East (Hume) Region to effectively and efficiently respond to future emergencies caused by floods, and will remain current until rescinded by authority of the Victoria State Emergency Service (VICSES) Chief Officer Operations.

_____ Date: _____

Tim Wiebusch

Chief Officer Operations

This plan is produced by VICSES and has been adapted from the SERP – Flood 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 East (Hume) Region:

Regional Manager – North East (Hume) Region

Victoria State Emergency Service

64 Sydney Road, Benalla, Victoria 3672

Email: northeast@ses.vic.gov.au

Website: www.ses.vic.gov.au

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.

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1. Introduction

1.1. Purpose

The purpose of this plan is to provide strategic guidance for the effective emergency management of floods in the North East (Hume) Region.

1.2. Objective

The objective of the North East (Hume) Region Flood Emergency Response Plan is to outline the regional arrangements for ensuring an integrated and coordinated approach to the management of flood events across North East (Hume) Region, in order to reduce the impact and consequences of these events on the community, infrastructure and services.

1.3. Scope

This North East (Hume) Region Emergency Response Plan – Flood Sub-plan includes:

- Description of potential risks and consequences of floods to the social, built, agricultural and natural environments within the North East (Hume) Region.
- Regional specific emergency management arrangements for the management of floods.
- 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 East (Hume) Region Emergency Response Plan (yet to be developed) will detail specific arrangements for the management of emergencies within the North East (Hume) Region. This plan has been developed as a subordinate plan of the North East (Hume) Region Emergency Response Plan and the SERP – Flood 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*
- *Alpine Resorts (Management) Act 1997*

1.1. Activation of the Plan

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

1.5. 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.

1.6. Linkages

This plan is a sub-plan of the SERP – Flood Sub-plan and the North East (Hume) 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.

This plan outlines regional response arrangements which impact arrangements detailed in Municipal Flood Emergency Plans (MFEPs) developed at municipal level and are also subordinate plans to Municipal Emergency Management Plans (MEMPs). It is likely that flood events will occur in conjunction with severe weather.

For arrangements regarding management of severe weather events, refer to the SERP – Storm Sub-plan and North East (Hume) Region Storm Sub-plan at <https://www.ses.vic.gov.au/em-sector/vicses-emergency-plans>.

Arrangements within this plan have not been repeated from the fore mentioned plans, unless necessary to ensure context and readability. All available Victoria State Emergency Service Plans can be accessed at www.ses.vic.gov.au, and more information on MFEPs can be accessed by respective council websites or as outlined in section 4.5 Municipal Flood Planning.

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

- Health response – State Health Emergency Response Plan (SHERP)
- Rescue – Victorian Urban Search and Rescue Response Arrangements (USAR).

1.7. 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. Region Flood Scenarios have been created to support this function available in Attachment 1 – Region Flood Scenarios. Exercises 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 North East (Hume) Region requiring the management of a flood event will be regarded as exercising of the plan. The event is to be evaluated and reviewed, as outlined above.

1.8. 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. Flood risk within the North East (Hume) Region

2.1. Region description

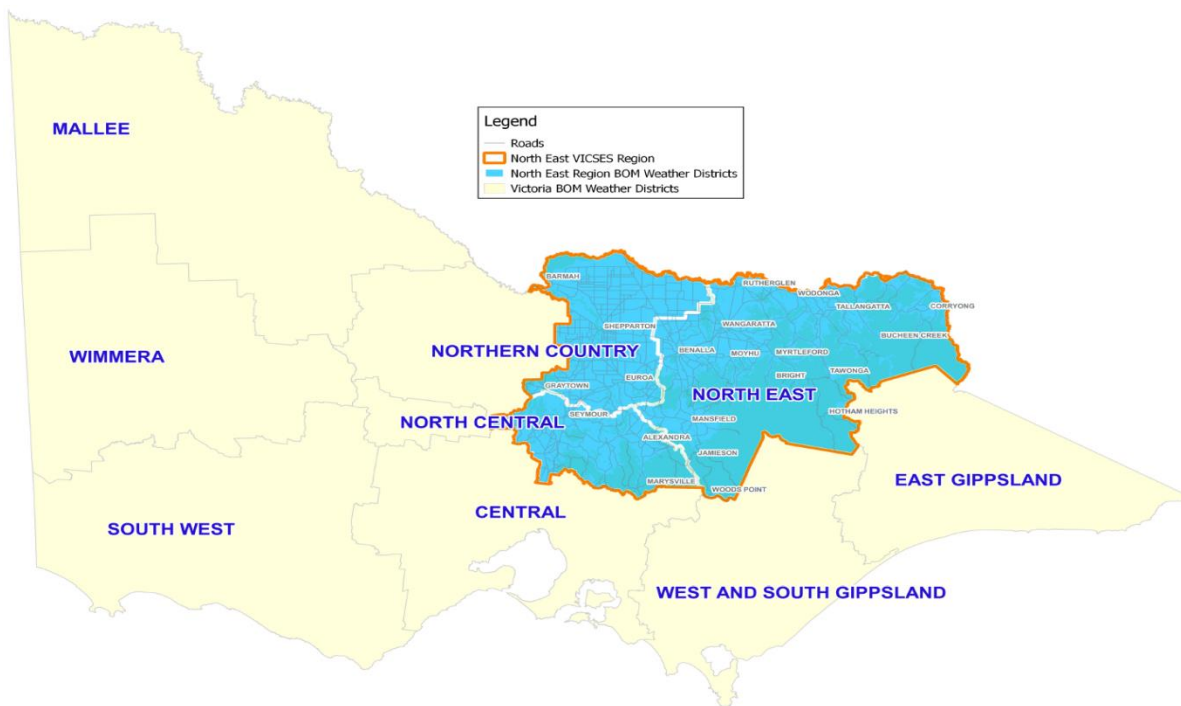
The North East (Hume) Region extends over 40,000 square kilometres of northeast Victoria, encompassing many communities that are culturally rich and diverse.

The region contains 12 local government areas, including Alpine, Benalla, Greater Shepparton, Indigo, Mansfield, Mitchell, Moira, Murrindindi, Strathbogie, Towong, Wangaratta and Wodonga. It is geographically varied, including Victoria's alpine resort areas such as Mt Hotham, Falls Creek, Mt Buller, Mt. Sterling and Lake Mountain.

The region includes the Murray River from Tom Groggin to where the Goulburn River enters the Murray River and the entire course of the Goulburn, Ovens, Broken, Kiewa, and King Rivers. The northern boundary of the region is the Murray River and flood responses in that area are a joint operation with New South Wales (NSW). A map of the main rivers in the North East (Hume) Region of Victoria can be viewed on page 10.

The North East (Hume) Region comprises four Bureau of Meteorology (BOM) weather districts, including North Central, North East, Northern Country, and Alpine. The multiple weather forecast districts can create complexities, considering three different forecasts have an impact on weather and predictions over the entire Region.

Two Catchment Management Authorities (CMAs), being Goulburn Broken and North East, cover the majority of North East (Hume) Region. Further details about North East (Hume) Region CMAs are provided in *Section 2.3 North East (Hume) Region Catchment Management Authorities (CMAs)*.



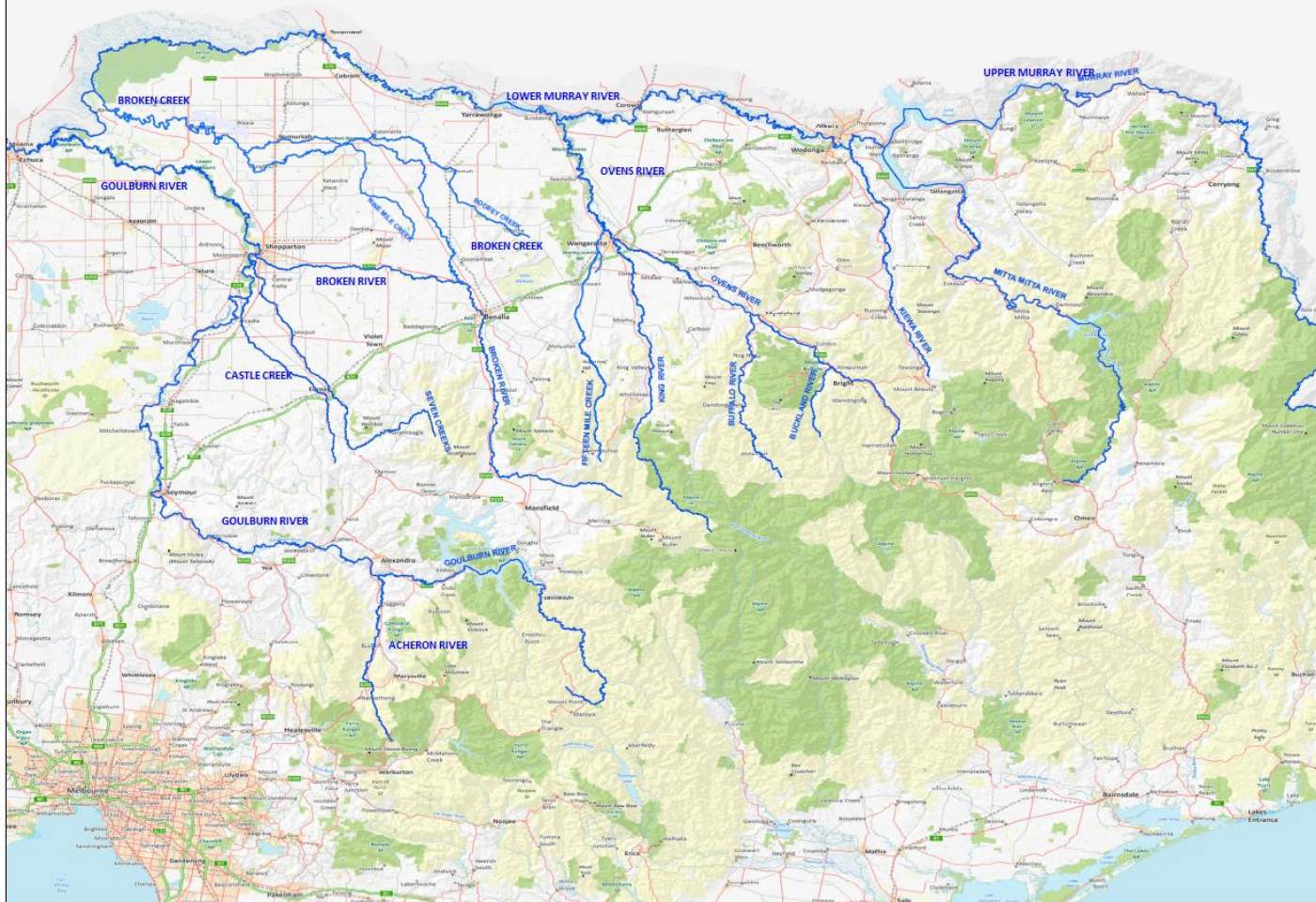
Map of BOM Weather Districts in North East (Hume) Region
Source: Q-GIS

North East Victoria Rivers



Legend

— Main Rivers



Disclaimer:
This map is a snapshot generated from Victorian Government data as well as data from various other sources. This does not guarantee that the publication is without flaw of any kind or a wholly appropriate for your particular purposes and therefore disclaims all liability for error, loss or damage which may arise from reliance upon it. All persons accessing this information should make appropriate enquiries to assess the currency of the data.

This map has been produced in the Hume Region
Date Prepared: 2/3/12

2.2. The flood hazard

Flooding may be defined as an overflowing or influx of water from its normal confines onto land not usually submerged. Within the North East (Hume) Region the following mechanisms may cause flooding:

- **Heavy rainfalls**, which cause runoff to enter watercourses, overtopping the banks of rivers and creeks, overflowing lakes, detention basins and stormwater drains, causing local overland flooding, or resulting in releases or spills from dams. Many factors contribute to the extent and nature of flooding caused by heavy rainfall such as the amount and duration of rainfall, the spatial distribution of rainfall, prior weather conditions, and characteristics of a catchment, including its size, shape, soil types, vegetation and land use. The characteristics of a river also influence the extent of flooding. These characteristics include the size and nature of the river, the presence of vegetation in and around the river, flood control structures, and embankments that may restrict floodwater and downstream river levels.
- **Snow melt**, which involves increased surface run off from warmer climatic conditions such as warm winds or rain.
- **Dam failure**, which involves the failure of a dam structure. There are a number of significant dams throughout Victoria that both store and provide water to communities across the State which have the potential to cause flooding in the event of failure. However, there are dam safety risk management processes in place. While the possibility of dam failure is considered low the consequences could be catastrophic in some circumstances.
- **Levee failure**, which involves the failure of a levee structure. There are a large number of levees across Victoria created to redirect flood water to minimise impacts of flooding. Levee failure can result from poorly created and/ or maintained levee structures or overtopping of levee structures due to significant water flows exceeding the structures capacity.

Flooding in Victoria is influenced by our variable climate, typified by periods of wet and dry conditions. A major factor in this variability is the El Niño – Southern Oscillation phenomena (ENSO). La Niña, the positive phase, is associated with colder than average sea surface temperatures in the central and eastern tropical Pacific region. La Niña is normally associated with higher than average winter, spring and early summer rainfall over much of Australia, and this can result in more flooding. Flooding in Victoria can also be influenced by the north/ south movement of the strong westerly winds and their associated cold fronts. A shift northwards results in more storms over southern Australia.

Positive Indian Ocean Dipole (IOD) events are often associated with El Niño and negative events with La Niña. When the IOD and ENSO are in phase the impacts of El Niño and La Niña events are often most extreme over Australia, while when they are out of phase the impacts of El Niño and La Niña events can be diminished.

Intense heavy rainfall over a short period of time can cause flash flooding to occur within minutes to hours. Flash flooding can be defined as ‘flooding occurring within about 6 hours of rain, usually the result of intense local rain and characterised by the rapid rises in water levels (BOM, 2012)¹.

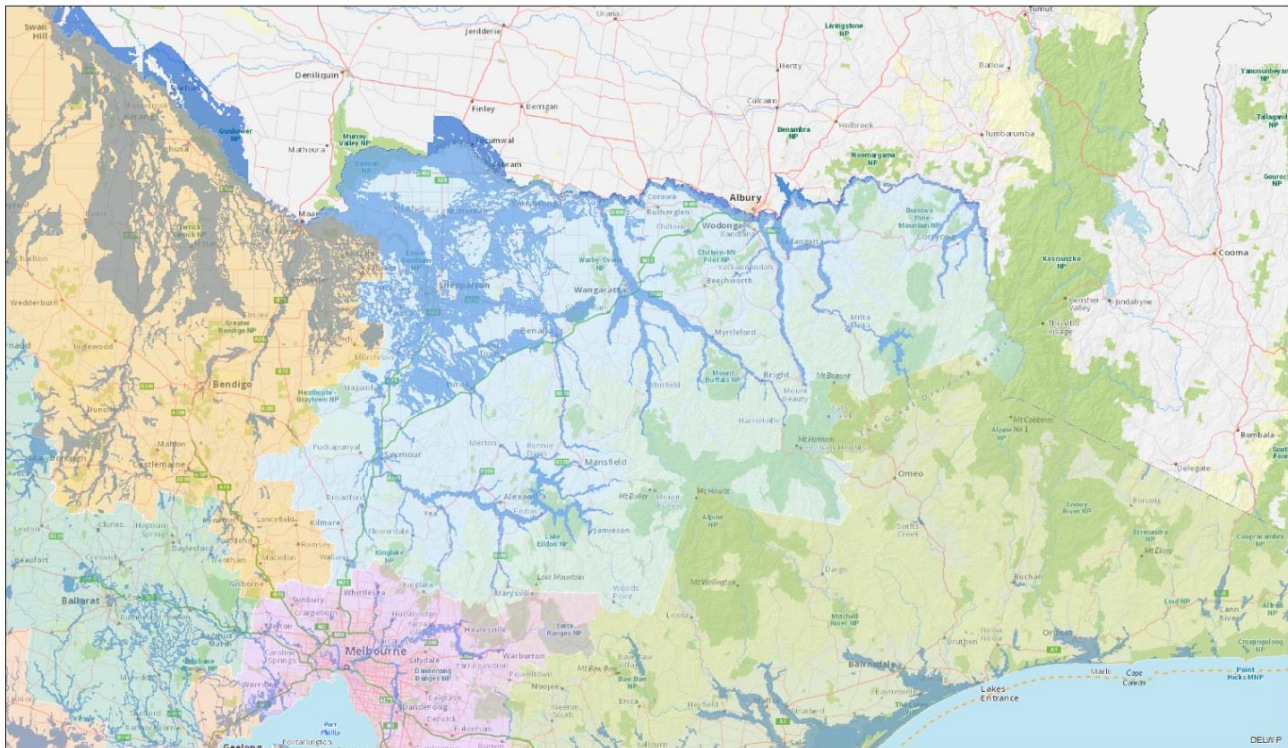
As there is little warning time, flash flooding is difficult to predict and manage. In larger catchments, floods can occur over several days to weeks, and are easier to forecast and manage.

Aggregated data from the 2017 Community Emergency Risk Assessment (CERA) findings report shows that out of the 15 municipalities and Alpine Resort Management Boards (ARMB) within North East (Hume) Region, eight have a perceived high risk of being impacted by flood events.

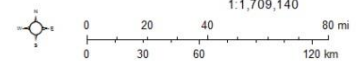
Below is a map of areas susceptible to a 1% probability of riverine flooding (1% Annual Exceedance Probability (AEP)), otherwise known as a 1 in 100 year flood event, in the North East (Hume) Region.

¹ Bureau of Meteorology (nd) Arrangements for Flood Warning Services in Victoria from the Weather Services Handbook, February 2001, [\[Available Online\]](#)

FloodZoom 1% AEP Flood Extent - VICSES North East (Hume) Region



February 12, 2018



Disclaimer: this map is a snapshot generated from Victorian Government data. This material may be of assistance to you but the State of Victoria does not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for error, loss or damage which may arise from reliance upon it. All persons accessing this information should make appropriate enquiries to assess the currency of the data.

Map of 1% AEP Flood Extent in North East (Hume) Region
Source: FloodZoom

2.3. North East (Hume) Region Catchment Management Authorities (CMAs)

Below is an outline of the management arrangements for the major catchments contained within the North East (Hume) Region.

The Goulburn Broken CMA

Situated in northern Victoria and part of the Murray Darling Basin, The Goulburn Broken Catchment comprises the catchments of the Goulburn and Broken rivers and part of the Murray River valley. The catchment covers 2,431,655 Ha or 10.5% of the state of Victoria.

The region stretches from close to the outskirts of Melbourne in the south to the Murray River in the north. The catchment includes Victoria's main water storage, Eildon and the popular Mt Buller Alpine Resort. It includes the municipalities of Moira, Campaspe, Mitchell, Murrindindi, Mansfield and Strathbogie Shires, Benalla Rural City and the City of Greater Shepparton.

Approximately 1.4 million hectares is dryland agriculture, 270,600 hectares is intensive irrigated agriculture and 800,000 hectares is public land. The region supports major agricultural (dryland and irrigated), food processing, forestry and tourism industries. The major commodity is food, but wool, timber, tourism and recreation are also vitally important to the region's economy. The annual economic output of the area is \$4.5 billion.

Over 200,000 people live in the catchment. Rapid population growth is occurring in some parts of the catchment, most notably in centres within commuting distance of Melbourne and the City of Greater Shepparton.

The region has a large indigenous population (approximately 6000) as well as a large number of people from culturally and linguistically diverse backgrounds including people from many parts of Europe and the Middle East.

Major natural resource issues are water quality, dryland salinity, native vegetation decline, biodiversity and pest plants and animals.

The North East CMA

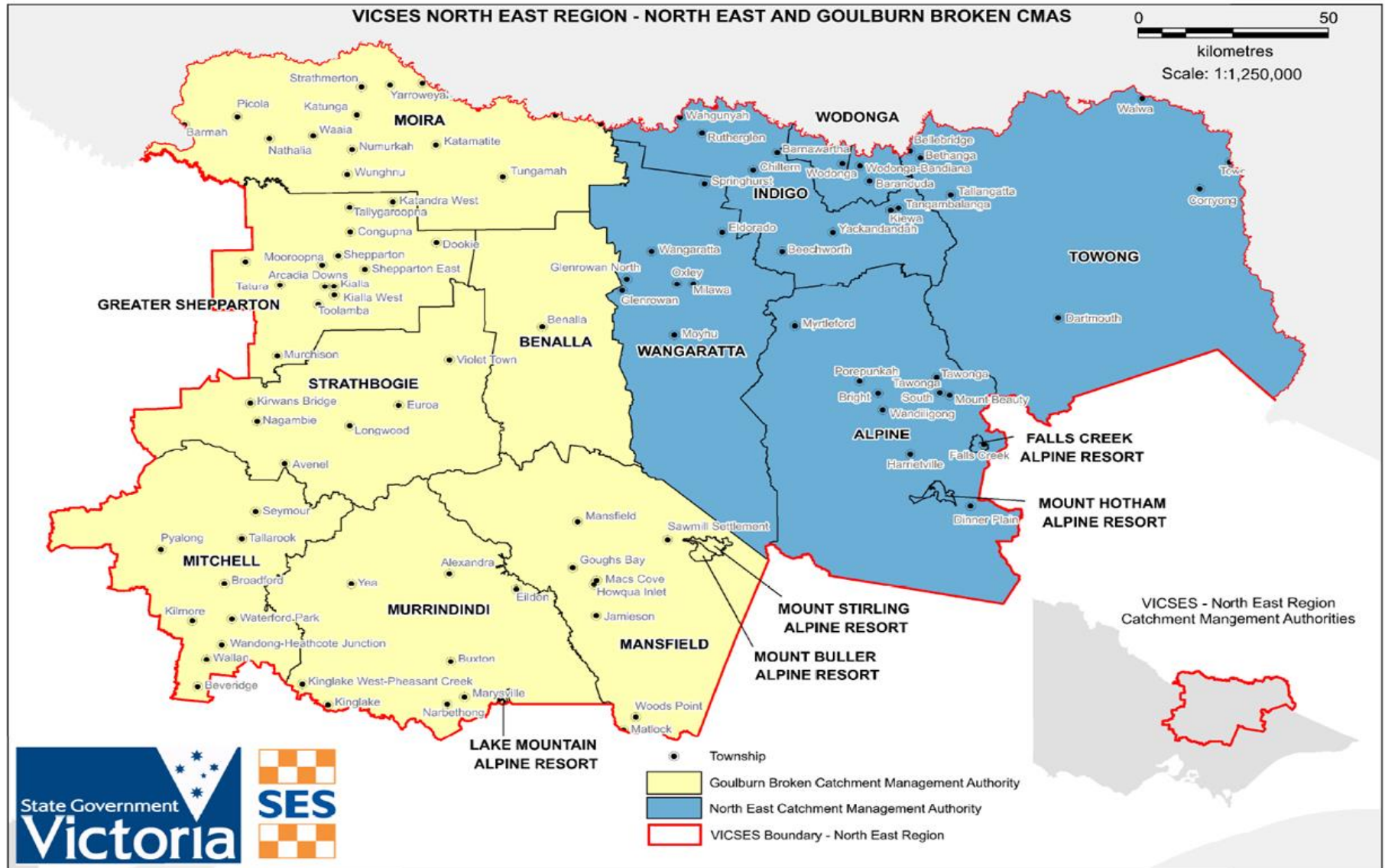
The region is bounded by the Murray River in the north, the Victorian Alps in the south, the NSW border in the east and the Warby Ranges in the west. It takes in the local government municipalities of Wodonga, Indigo, Wangaratta, Alpine and Towong, plus parts of the Moira and East Gippsland shires. It covers the catchment of the Upper Murray, Mitta Mitta, Kiewa, Ovens and King rivers.

Approximately 102,000 people live in the north east, contributing some \$3.24 billion a year to Victoria's economic wealth. The main industries in the region are agriculture (dairy, beef, lamb, wool, cropping and horticulture), forest products, tourism, value-added processing industries and manufacturing.

The North East Region plays a vital role in providing water resources for south-eastern Australia. Although it comprises only 2% of the geographic area of the Murray-Darling basin, the region's river basins contribute 38% of the total water in the Murray-Darling Basin system.

Below are maps of the North East CMA and Goulburn Broken CMA areas and corresponding municipalities in the VICSES North East (Hume) Region.

Unlike other regions in provincial Victoria there is no single dominant major regional city, allowing regional centres such as Wodonga, Wangaratta, and Shepparton to service distinct sub regions, and the urban fringe growth corridor of Mitchell Shire.



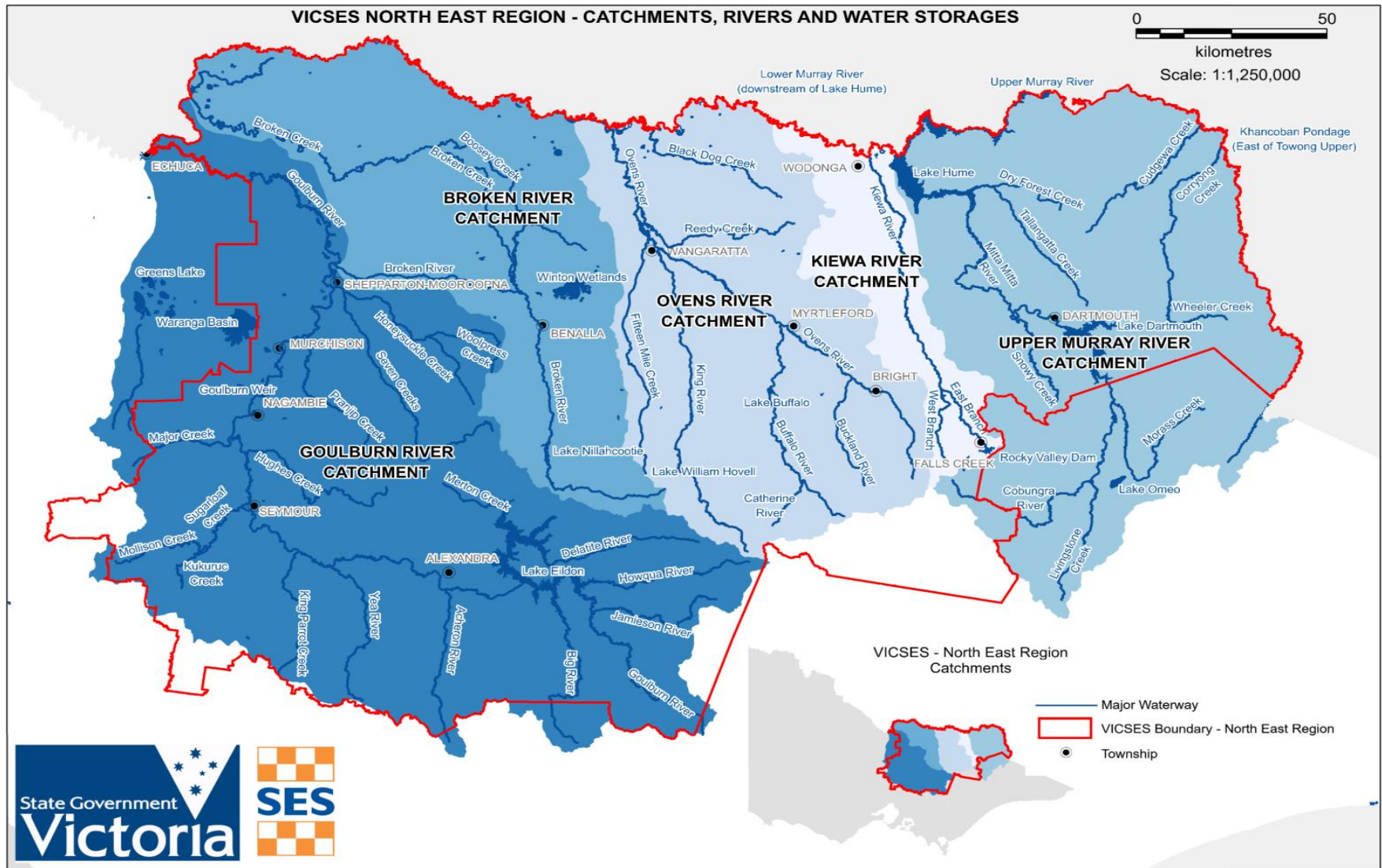
Map of CMAs in North East (Hume) Region
 Source: NMT WBM Pty Ltd

2.4. North East (Hume) Region catchments, flood gauges, schematics and intelligence cards

The following major catchments are contained within the North East (Hume) Region:

- Broken River Catchment
- Goulburn River Catchment
- Kiewa River Catchment
- Ovens River Catchment
- Upper Murray River Catchment.

A map of major catchments in the North East (Hume) Region is provided on page 16.



Map of Major Catchments in North East (Hume) Region
Source: BMT WBM Pty Ltd

Detailed maps of VICSES North East (Hume) Region major catchments with locations of gauges can be found in Attachment 2 – Catchments and Flood Gauges.

Catchment schematics for each of the North East (Hume) Region catchments are available for registered users in FloodZoom, accessible via www.floodzoom.vic.gov.au.

Flood Intelligence Cards for each municipality in the North East (Hume) Region are available within MFEPs. A complete list can be accessed in Attachment 3 – Municipal Flood Emergency Plans (MFEPs) and Local Flood Guides.

2.5. Regional flood risks

Regional flood risks, including urban, rural and communities at risk of experiencing isolation in North East (Hume) Region, are outlined in respective MFEPs (refer to Attachment 3 for full list of plans) and should be referred to during operational activity.

The tables below provide a brief summary of key known urban and rural communities at risk of flooding in the North East (Hume) Region. Communities at risk of isolation have not been summarised here due to the variance in impacts caused by complexities with different flooding types and levels – refer to MFEPs.

Note – cells have been marked with a symbol (-) to reflect gaps in data associated to known impacts of flooding. The available data relies on data captured through local flood studies or record keeping of historic flood events which can inform impacts to communities.

City/ town	Properties affected in 20% AEP event	Properties affected in 10% AEP event	Properties affected in 5% AEP event	Properties affected in 2% AEP event	Properties affected in 1% AEP event	Travel time (hrs)
North East CMA						
Wangaratta	Total 20 Above floor 1 19 affected	Total 20 Above floor 2 18 affected	Total 195 7 residential above floor 0 commercial above floor 188 below floor	Total 264 28 residential above floor 2 commercial above floor 234 below floor	Total 307 53 residential above floor 2 commercial above floor 252 below floor	Rocky Point – Wang 14- 30hrs
Myrtleford	-	Total 81 Above floor 10 Below floor 71	Total 138 Above floor 71 Below floor 111 5.9m @ Eurobin Gauge	Total 221 Above floor 63 Below floor 158 6.2m @ Eurobin Gauge	Total 368 Above floor 194 Below floor 174 7.0m @ Eurobin Gauge (0.5% flood data)	From Bright typically 4hrs, but can be 1-9hrs
Chiltern	Total 14	Total 25	Total 37	Total 56	Total 71	Property impacts associated with rainfall amounts and location. This is exacerbated by quick catchment response (approx. 1hr) meaning little or no warning time.

Kiewa	Low lying areas and minor inconvenience may require stock and machinery removal. Minor roads may be closed and low level bridges submerged.	-	Consider evacuation of some houses in proximity to Kiewa store. 3.70m Kiewa River @ Kiewa Gauge	Rural inundation substantial. Removal of stock required. 3.71m Kiewa River @ Kiewa Gauge	Extensive rural and urban inundation, likely isolation. 3.75m at Kiewa River @ Kiewa Gauge	-
Wodonga (Kiewa River Bandiana)		Extensive floodplain inundation, local road closures. 3.32m Kiewa River @ Bandiana	-	Extensive and deep flooding of farmland in the floodplain. Closure of south end of Pollards Road and numerous private access tracks within the floodplain. Kiewa Valley Highway flooded. 3.60m Kiewa River @ Bandiana	Gateway island over topped.	-
Wodonga (Murray River Gateway Island)			Land around the commercial developments (i.e Three Monkeys Tavern) is identified as predisposed to flooding (Doctors Point 6.7m). Peripheral inundation occurred adjacent to buildings in the northern part of the commercial area (i.e. La Maison) in October 2016 (Doctors Point 6.53m). Diamond Park and Harris and Lemke Roads inundated.		Hume Freeway crossing of the Murray River floodplain between Wodonga and Albury is well elevated, approximately 2m above 1% AEP.	

Wodonga (House and Huon Creeks)			Sanctuary Boulevard – levee protection provided to 25 houses which would otherwise be subject to above floor flooding in events exceeding 20 year ARI.		Cypress Court and Park Lane contain a small number of houses (approximately 10 in total) exposed to flooding. Levees are proposed for future implementation in these areas	
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City/ town	Population affected	Properties affected in 5% AEP event	Properties affected in 2% AEP event	Properties affected in 1% AEP event	Warning time (hrs)
Goulburn Broken CMA					
Nathalia	1,902	Total 30 Above floor 10 Below floor 20	Total 37 Above floor 15 Below floor 22	Total 42 Above floor 17 Below floor 25	2-4 days from Walsh's Bridge
Wunghnu	535	-	-	11 in 2012	Ungauged system
Numurkah	4,768	Total 59 Above floor 8 Below floor 51	Total 211 Above floor 50 Below floor 161	Total 393 Above floor 108 Below floor 285	-
Tungamah	287	-	-	Above floor 10–20	2-3 days
Barmah	181	0 if levees are sandbagged	Total 51	Total 51	5-7 days
Cobram	6,018	Protected by levees	Protected by levees	Protected by levees	1 day from Yarrawonga
Yarrawonga	7,057	0	0	-	1.5 days from Corowa
Bundalong	604	-	-	-	-
Mansfield	4,360	0	0	>6	-
Jamieson	384	19+ of 78 caravan parks	-	27+ of 78 caravan parks	Nil
Seymour	6,360	Total 218 Above floor 115 Below floor 103	Total 236 Above floor 201 Below floor 35	Total 243 Above floor 233 Below floor 10	Levee planned. Goulburn 12 – 24 hrs
Yea	1,600	Total 33 Above floor 28 Below floor 5	Total 34 Above floor 29 Below floor 5	Total 38 Above floor 30 Below floor 8	12hrs
Buxton	257	Unknown	Unknown	Unknown	Nil A study is underway to identify properties affected.

Euroa	2,768	Total 202 Above floor 39 Below floor 163	Total 463 Above floor 106 Below floor 357	Total 644 Above floor 206 Below floor 438	5-12hrs
Violet Town	1,084	Total 143 Above floor 37 Below floor 106	Total 159 Above floor 55 Below floor 104	Total 162 Above floor 63 Below floor 99	3hrs
Benalla	9,328	Above floor 34 4.6m Broken River @ Benalla Gauge	Above floor 162 5.10m Broken River @ Benalla Gauge	Above floor 1081 5.5m Broken River @ Benalla Gauge	5- 6hrs
Shepparton	49,371	Broken/ Sevens Dominant Total 282 Above floor 129 Below floor 153 ----- Goulburn Dominant Total 410 Above floor 103 Below floor 307	Broken/ Sevens Dominant Total 5051 Above floor 1,207 Below floor 3,844 ----- Goulburn Dominant Total 3937 Above floor 831 Below floor 3,106	Broken/ Sevens Dominant Total 7043 Above floor 3,048 Below floor 3,995 ----- Goulburn Dominant Total 7043 Above floor 2,160 Below floor 4,412	>24 hrs

2.6. Major dams

VICSES, while not responsible for dam management, is responsible for the response to the flooding caused by dam failure – when water overflows dam walls. More information regarding dams in the North East (Hume) Region may be accessed within the respective MFEPs listed in Attachment 3 – Municipal Flood Emergency Plans (MFEPs) and Local Flood Guides.

A list and description of major dams located within the region is provided in the table below.

Dam name	Location	Capacity (megalitres)	Dam Safety Emergency Plan Owner	Hard copy of Plan at VICSES Regional Office (Y/N)
Hume Dam	Wodonga	3,005,157mL	Water NSW	Y
Dartmouth Dam	Dartmouth	3,856,232mL	Goulburn Murray Water	Y
Lake Buffalo	Mt Buffalo	23,504mL	Goulburn Murray Water	Y
Lake William Hovel	Whitlands	13,690mL	Goulburn Murray Water	Y
Rocky Valley Reservoir	Falls Creek	28,000mL	-	N
Lake Eildon	Mansfield	3,334,158mL	Goulburn Murray Water	Y
Lake Nillacootie	Swanpool	40,400mL	Goulburn Murray Water	Y
Lake Nagambie	Nagambie	25,500mL	-	N
Nils Gully	Myrtleford	-	North East Water	Y
Goulburn Weir	Near Shepparton	25,500mL	Goulburn Murray Water	Y
Lake Sambell	Beechworth	-	North East Water	Y
Bakers Gully	Bright	-	-	N
Yarrowonga Weir	Yarrowonga	-	Goulburn Murray Water	Y
Kerferd Dam	Near Stanley	-	North East Water	Y
Kiewa Dam (Basin)	Adjacent tp	-	-	Y
Mount Beauty Pondage	Mount Beauty	-	-	Y
Rocky Valley Storage	Bogong High Plains, near Falls Creek	-	-	N
Lake Loombah & McCall SAYS Reservoir	East of Tatong south east of Tatong	-	North East Water	Y

A list and description of major dams located outside the region which pose a regional risk is provided in the table below.

Dam name	Location	Capacity (Megalitres)	Dam Safety Emergency Plan Owner	Hard copy of Plan at VICSES Regional Office (Y/N)
Waranga Basin	Rushworth	432,360mL	Goulburn Murray Water	Y
Greens Lake	South east of Rochester	32,500mL	-	-
Khancoban Pondage	Corryong area	-	Snowy Hydro	Y

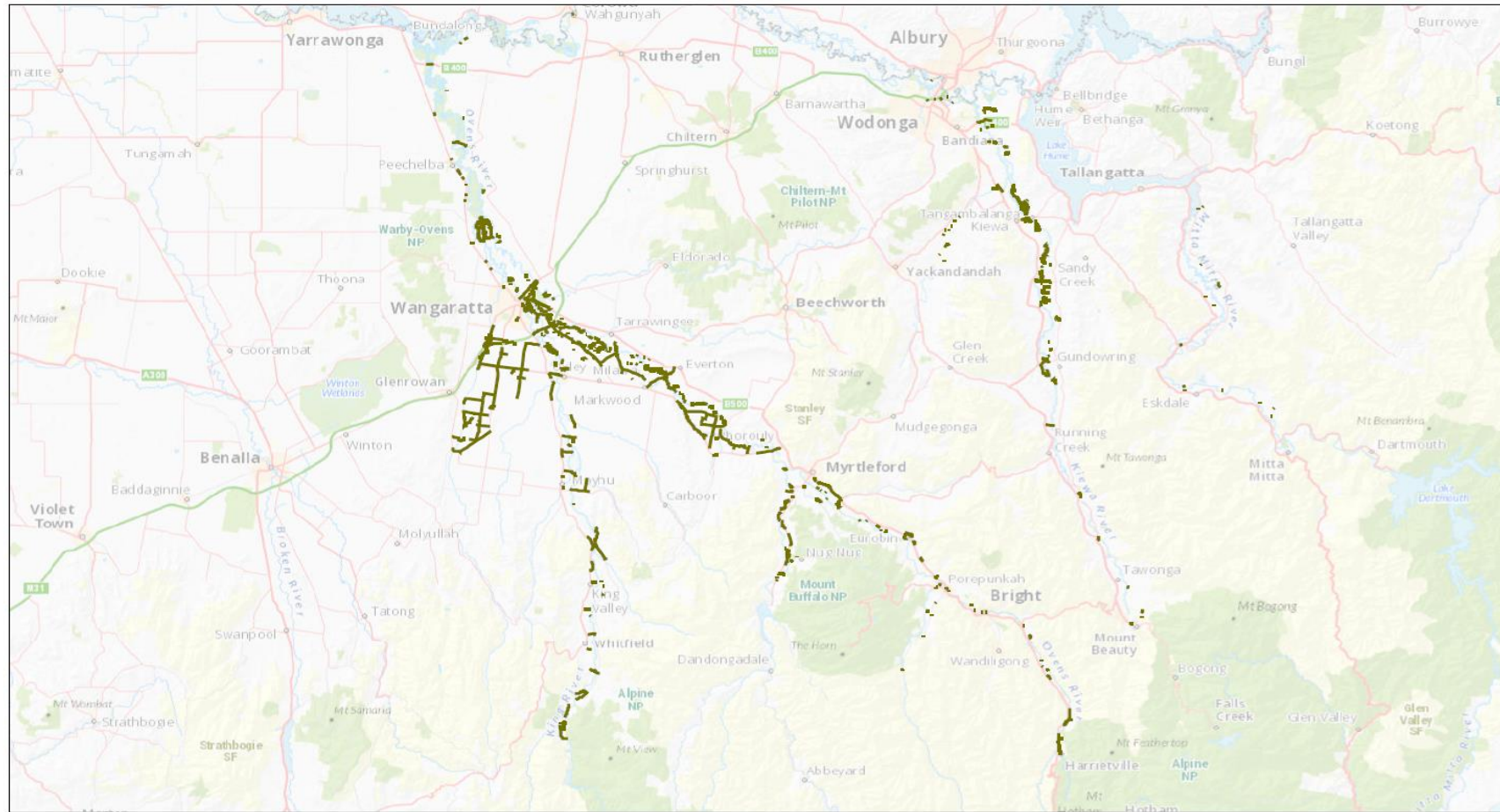
2.7. Levee Management

Flood levees are a flood mitigation tool used to redirect flood water to reduce potential impacts on a community. Significant levee systems that are nearby communities within North East CMA and Goulburn Broken CMA areas in the North East (Hume) Region are summarised below.

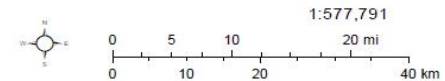
See relevant MFEPs for more detailed information.

Levee name	Area protected	Design height (AEP%)	Additional information
Wangaratta			
Parfitt Road Levee, Wangaratta	77 Residential properties 28 Commercial properties 1 Church 2 Hotels 2 Caravan Parks	0.8 AEP% (600mm freeboard) protection to a flood of (Ovens/King flood 125yr. ARI with no freeboard, equivalent to 50yr ARI with 600mm freeboard. Levee system currently does not provide adequate 1% AEP protection with Bowser Road overtopping and extensive sections of the levee having less than the preferred 300mm freeboard particularly along the eastern and south-western sections of the levee system (<i>Wangaratta Urban Flood Study, 2017</i>).	3.46km combination of earth, road and concrete wall. Note degree of levee failure in 2016 flood requiring significant urgent sandbag stabilisation. Community advised to evacuate.
Wilson Road Levee, Wangaratta	42 Residential properties	2 AEP% (600mm freeboard). Levee protection to a flood of 20-50yr (Ovens/King flood). ARI with no freeboard, equivalent to 5yr. ARI with 600mm freeboard. Wilson Road Levee system currently does not provide adequate 1% AEP protection with two main sections of the levee having less than the preferred 300mm freeboard (<i>Wangaratta Urban Flood Study, 2017</i>).	2.17km Earth Levee At 12.7m level Wilson Road levee area advised to evacuate unless the levee has failed before this (stability concerns during September 2010 due to works completed a few years earlier). In 2010, engineer rated stage 3 of 4 levee failure near King River face. Community advised to evacuate.
Sunset Drive Levee, Wangaratta	8 Residential properties (Sunset Dr, Walter St & Hilandra Ave)	At 8.54m 15 Mile Ck at Greta Sth gauge (= 1993 flood level). 53 homes flooded along One Mile Creek. The Sunset Drive -Walter Street area levee is designed to this level.	Combined earth and concrete wall
Merriwa Park Levee,	Christopher Robin Kindergarten	Not engineered to 1:100 (provides partial protection only).	Earth Levee

Wangaratta	Wangaratta Tennis Club		
Diversion Channel, Wangaratta	Properties along the One Mile Creek system	One Mile Creek flow is throttled at the Freeway and redirected along the diversion channel on the upstream side of the Freeway in order to provide protection to properties along One Mile Creek within Wangaratta.	Diversion Channel 2.8km from the One Mile Creek to the Ovens Rivers alongside the south eastern side of the Hume Freeway.
Sanctuary Boulevard Levee, Wodonga (House Creek)	Low lying houses, approx. 26 homes	Flood protection to 1% AEP and freeboard	Earth Levee
Park Lane & Cypress Court, Wodonga (House Creek)	Council is currently (2017) investigating options for local flood protection levees at Park Lane and Cypress Court on House Creek.	Each levee may provide protection for 5 houses where above floor flooding commences in 5% AEP event.	Planned – NOT IN PLACE



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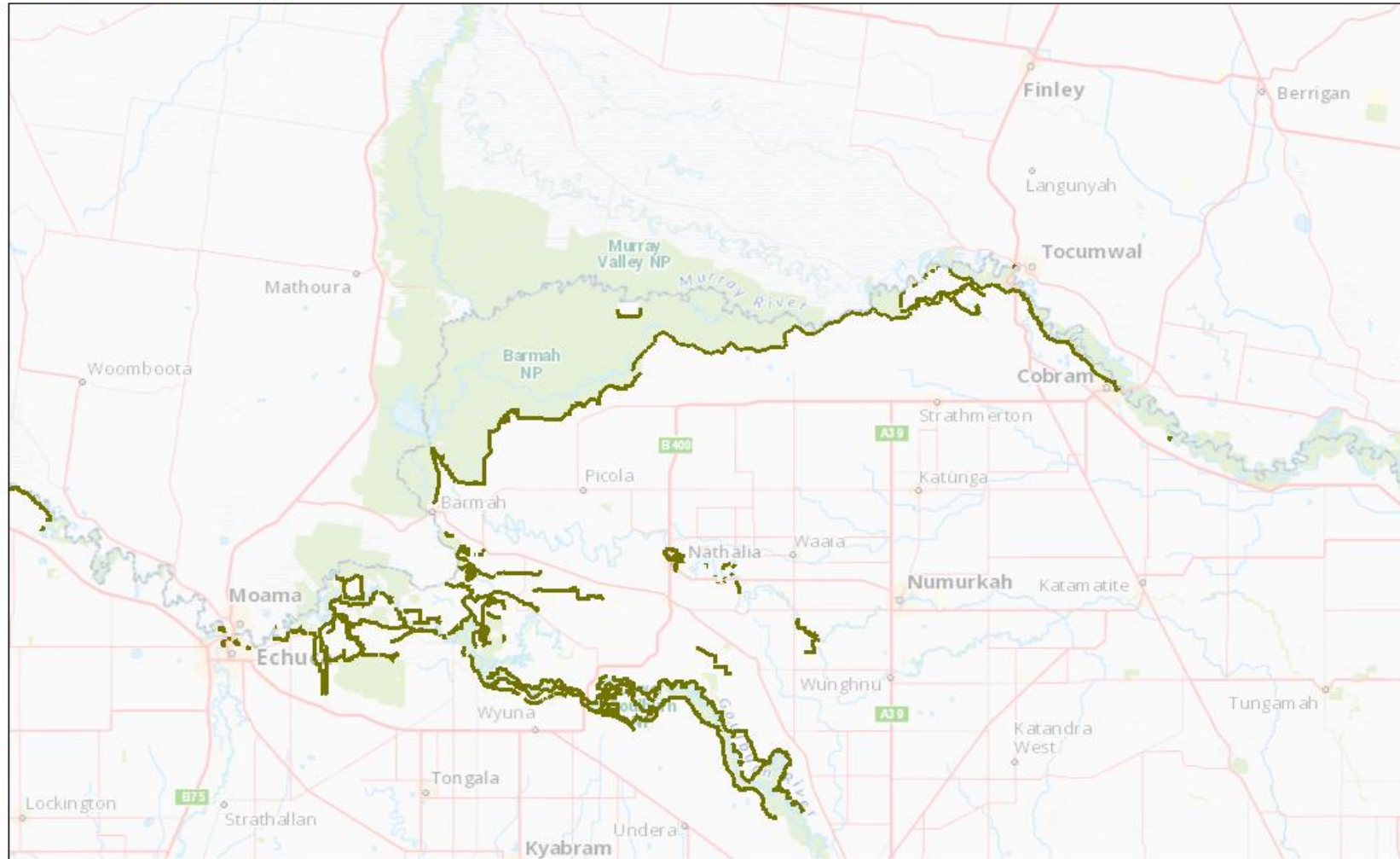


Disclaimer: this map is a snapshot generated from Victorian Government data. This material may be of assistance to you but the State of Victoria does not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for error, loss or damage which may arise from reliance upon it. All persons accessing this information should make appropriate enquiries to assess the currency of the data.

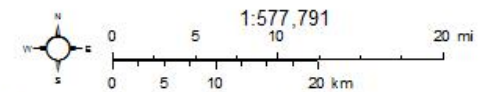
Map of levees within North East CMA Boundary
Source: FloodZoom

Levee name	Area protected	Design height (AEP%)	Additional information
Cobram			
Cobram Town Levee	Cobram Township	1 AEP % (600mm freeboard)	<p>Key elements of the Cobram town levee scheme include:</p> <ul style="list-style-type: none"> ▪ Dick's spillway: Allows flooding to breakout to a natural lower lying floodplain. The breakout reduces the flow in the river and in turn the flood levels along the river through Cobram. The spillway has been reinforced to withstand overtopping, with a non-erodible top layer. ▪ Levee adjacent to Wyatt Road (Cavagna's Levee): A short section (300m) of earthen levee prevents breakout towards Pullar Road. ▪ River Road: Elevated allotments act as a levee to the north and east of Scenic Drive. A concrete wall (Densons Levee), landscaped as the front property fence, provides flood protection between Scenic Drive and Mookarii Street. Temporary flood barriers are required across Mookarii Street. ▪ Town Levee: This levee extends from Mookarii Street to near Harris Road and adjoins the PWD levee.
Nathalia			
Nathalia Town Levee	Nathalia Township	1 AEP % (600mm freeboard)	<p>Key elements of the town levee scheme include:</p> <ul style="list-style-type: none"> ▪ Along both banks of the Broken Creek and around parts of the town (see maps at Appendices C and F of the MFEP), noting that while the majority of the levee comprises a series of engineered earthen banks; road openings and the foreshore area are protected by a demountable aluminium panel system which is erected ahead of an approaching flood. ▪ GMW's No. 12 channel acts as a levee on the south side of town.
Murray River Downstream (D/S) of Hume			
Murray River Levee at Woods Rd near Brimin (East M)	Farmland	-	Length: 559.383, between Corowa and Bundalong. Most are mounded earth.
Murray River Levee at Woods Rd near Brimin (East M)	Farmland	-	Length: 298.996, between Corowa and Bundalong. Most are landscaping or mounded earth.

Dicks Levee Cobram East	Farmland	Important control spill point for Murray River in that area.	Length: 438.852
Cavagnas Levee between Cobram East and Cobram	Farmland	-	Length: 115.750. Most are landscaping or mounded earth.
Cobrom Town Levee	Residences	1% AEP plus freeboard of 250mm	-
Ulupna Island	(Caravan park)	10 year ARI event.	14kms long. Most are landscaping or mounded earth.
Murray River Levees From Cobram to Barmah	Farmland	Ranges from 300mm in height to be 300mm above 1% AEP	Most are landscaping or mounded earth.
Lower Goulburn Levees from Barmah to Lower Moira	Farmland, rural houses in Lower Moira	-	Most are landscaping or mounded earth.



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Map of levees within Goulburn Broken CMA Boundary
Source: FloodZoom

2.8. Regional resources

A full list of key regional resources that are available within the North East (Hume) Region for flood response can be accessed in Attachment 4 – Regional Resources.

Regional resources are included in the MFEPs listed in Attachment 3 – Municipal Flood Emergency Plans (MFEPs) and Local Flood Guides.

Additional expert multi-agency resources may be accessed during operations through the Australasian Inter-Service Incident Management System (AIIMS) structure. A map of VICSES unit boundaries is provided in Attachment 5 – VICSES Unit Map, or accessible via Emergency Management – Common Operating Picture (EM-COP) for registered users.

3. Consequences

3.1. Possible flood consequences

The North East (Hume) Region has many flood prone communities. The effects of flooding on the community can include:

- Inundation of properties.
- Damage to essential infrastructure, public and private assets and property.
- Inundation of farmland, damage to crops and loss of livestock and fodder.
- Short or long term displacement of people.
- Isolation of properties or communities.
- Disruption to essential services.
- Death and injuries.

Significant community disruption can occur as a result of damage to essential infrastructure, which may lead to cascading secondary consequences. For example a loss of power may result in a loss of telecommunications, traffic signals and disruption to supply chains amongst other impacts. Damage and flooding of road infrastructure may result in isolation of properties and/or communities.

3.2. Flood History

The Flood History Table below provides a summary of the municipalities within VICSES North East (Hume) Region that have been affected by flooding. For more detailed information about these historical floods and their consequences, please see Attachment 6 – Flood History and Possible Consequences.

Municipality	Number of years in which notable floods have occurred	Years
Alpine Shire	10	1854, 1870, 1917, 1974, 1993, 1998, 2010, 2012, 2016
Benalla Rural City	11	1854, 1870, 1916, 1917, 1954, 1966, 1974, 1993, 1998, 2010, 2012
Indigo Shire	9	1854, 1870, 1917, 1974, 1975, 1993, 1998, 2010, 2012
Mansfield Shire	13	1854, 1870, 1916, 1917, 1934, 1974, 1975, 1993, 1998, 2007, 2010, 2012
Mitchell Shire	13	1854, 1870, 1916, 1934, 1973, 1974, 1975, 1989, 1993, 1998, 2010, 2012, 2016

Moira Shire	13	1854, 1867, 1870, 1916, 1917, 1939, 1973, 1974, 1975, 1993, 1998, 2010, 2012
Murrindindi Shire	14	1854, 1867, 1870, 1916, 1917, 1934, 1973, 1974, 1975, 1989, 1993, 1998, 2010, 2012
Shepparton Greater City	15	1854, 1867, 1870, 1916, 1917, 1939, 1973, 1974, 1975, 1989, 1993, 1998, 2010, 2012, 2016
Strathbogie Shire	17	1854, 1867, 1870, 1916, 1917, 1939, 1973, 1974, 1975, 1989, 1993, 1998, 2010, 2012, 2013, 2016
Towong Shire	15	1854, 1867, 1870, 1916, 1917, 1934, 1955, 1973, 1974, 1975, 1989, 1993, 1998, 2010, 2012, 2016
Wangaratta Rural City	17	1854, 1867, 1870, 1916, 1917, 1955, 1973, 1974, 1975, 1989, 1993, 1998, 2010, 2012, 2015, 2016
Wodonga City	15	1854, 1867, 1870, 1916, 1917, 1955, 1973, 1974, 1975, 1989, 1993, 1998, 2010, 2012, 2016

4. Community Resilience

4.1. Shared and individual responsibility for action

The National Strategy for Disaster Resilience, developed by the Council of Australian Governments, 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 flooding include:

- Individuals being aware of their flood risk, and following advice from emergency services when responding to warnings.
- Local governments and communities including flood risk within their CERA 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 flood risk.
 - Engaging with the community regarding flood risk.
 - Working with communities to plan the management of flood risk.
 - Providing emergency information and flood warnings.
 - Ensuring an effective, well-coordinated response during floods.
 - Helping communities to recover and learn following a flood, 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 floods. More information can be found at www.ses.vic.gov.au/get-ready.

4.2. Flood Warning Services

Flood warnings and notifications are provided by BOM and VICSES to the Victorian community. The flood warning services provided by BOM is dependent on local infrastructure, including flood gauges. The service is documented in the Service Level Specification for Flood Forecasting and Warning Services for Victoria which can be accessed at www.bom.gov.au/vic/flood/. A map of flood gauges for the North East (Hume) Region can be found at Attachment 2 – Catchments and Flood Gauges.

VICSES provides warnings and emergency information to the community by publishing Flood Community Notifications using EM-COP Public Publisher on the VicEmergency website: www.emergency.vic.gov.au/respond/.

Flood Community Notifications are informed by BOM, CMAs and local information and intelligence.

4.3. Regional Floodplain Management Strategies

Regional Floodplain Management Strategies outline how flood management agencies will work together to manage flood risks and increase community preparedness. They are prepared per CMA area and aligned with the Victorian Floodplain Management Strategy, emergency management arrangements and planning policy.

The flood strategies build on previous strategies and add new emphasis on:

- Governance arrangements for sustainably managing existing and new levees.
- An acknowledgement of the value of Aboriginal communities both in planning and responding to floods.
- Adapting to climate change to manage flood risk.
- Clarification around emergency management roles and responsibilities.
- Guiding principles to support the role of CMAs in land use planning.
- Clarification of who is responsible for maintaining flood warning gauges.
- Consideration of the environmental benefits of flooding.

The Regional Floodplain Management Strategies that exist within North East (Hume) Region are for North East CMA and Goulburn Broken CMA. They are to be completed during 2018 and will be located at:

- Goulburn Broken CMA: www.gbcma.vic.gov.au/
- North East CMA: www.necma.vic.gov.au/

4.4. Flood Intelligence

Flood intelligence supports decision making and planning for flooding by providing reliable and accurate information relating to:

- The level, depth and velocity of floodwater and its consequences.
- Determination of actions to be undertaken in response to the identified consequences.

VICSES works closely with CMAs, Department of Environment, Land, Water and Planning (DELWP), other agencies and trusted local sources to ensure available resources and platforms containing flood information and intelligence are utilised.

DELWP maintains the Victorian flood intelligence platform FloodZoom. FloodZoom is a web-based platform which assists VICSES and other emergency services agencies to identify the possible local consequences of flooding, and supports CMAs in land use planning and flood risk assessments.

EMV maintains the online multi-agency operational platform, EM-COP, used for sharing flood intelligence with the sector, before, during and after flood emergencies.

Knowledge obtained from local communities and organisations is a valuable part of the picture available to emergency services before, during and after emergencies. This local knowledge provides an invaluable 'on the

ground' understanding of an unfolding situation from the people who understand the area best. Refer to Attachment 3 – Municipal Flood Emergency Plans (MFEPs) and Local Flood Guides for relevant MFEPs.

4.5. Municipal Flood Planning

Municipal Flood Emergency Planning is managed by Municipal Emergency Management Planning (MEMP) Committees. MFEPs are created by municipalities that are considered to have a high susceptibility to flooding. MFEPs can be found online at respective council websites, FloodZoom for registered users, and on the VICSES website at www.ses.vic.gov.au.

A list of completed MFEPs finalised within the North East (Hume) Region is available in Attachment 3 – Municipal Flood Emergency Plans (MFEPs) and Local Flood Guides.

4.6. Community Engagement

Community engagement programs to build community resilience for flooding are conducted in accordance with the VICSES Community Resilience Strategy, as outlined in section 4.1 Shared and Individual Responsibility for Action. Programs include local engagement initiatives such as the development of a series of local flood guides that provide information of local flood risks to specific communities. These guides can be found at www.ses.vic.gov.au/get-ready

The North East (Hume) Region community engagement FloodSafe strategy involves, but is not limited to:

- Community and local knowledge consultation in development of local flood guides.
- Targeted doorknock delivery in high risk areas.
- Regular unit activities and events to reinforce the risk message.
- Participation in multi-agency activities including municipal flood education responsibilities.
- Participation in community led emergency planning.
- Building resilience and capacity within communities, for example, effective sandbag filling and laying techniques and cache locations.

4.7. Household and business plans

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

The North East (Hume) Region also supports local caravan park owners to 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.

4.8. Community safety advice

VICSES provides advice to the community in the form of key safety messages for minor, moderate and major flooding, 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 a flood event

5.1. Roles and responsibilities

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

5.2. Concept of Operations

The Concept of Operations for responding to floods is detailed in the SERP – Flood Sub-plan.

5.3. Escalation and notification

BOM publishes Flood Watches and Warnings, as detailed in Section 4.2 Flood Warning Service, on its public website (www.bom.gov.au) and provides these to pre identified agencies, organisations and media outlets, including pager and email warning messages to VICSES at the State and regional level.

Upon the receipt of a warning, the Regional Duty Officer (RDO) will notify the potentially affected and/ or affected communities by issuing Flood Community Notifications, and the Regional Agency Commander (RAC) will notify the Regional Controller (RC) and/ or Regional Emergency Management Team (REMT) members for flood response.

The escalation and notification process for flood response is operationalised by VICSES in Standard Operating Procedure (SOP) 009 – Flood 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 RC to support multi-agency response when significant impacts caused by a flood event occur. Associated flood readiness levels and incident control centre (ICC) footprints can be accessed within JSOP 2.03 Incident Management Team (IMT) Readiness Arrangements or the VICSES Flood Readiness and Activation Trigger Considerations (v3.0), also available via Attachment 7 – IMT Readiness Levels – Flood.

On receipt of advice from BOM of the potential for significant flooding the RAC will undertake strategic level planning in anticipation of an event. Key considerations will include:

- Establishing the control structure for managing the event.
- Provision of warnings and emergency information to the community.
- Preparations for possible evacuations including implementation of evacuation and emergency relief plans and identification of evacuation points.
- Confirming agencies at all tiers are activated and appropriate response arrangements are in place.
- Identifying the likely consequences of the flood event 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 assistance.
- Ensuring that flood mitigation structures have been checked and any issues identified.
- Identifying mass gatherings and large public events that may be 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 (EMLO) from key support agencies to the State Control Centre (SCC) and Regional Control Centres (RCCs), where appropriate.
- Arranging for regular meetings of the REMTs and IEMTs.
- Providing situation reports to the State Control Team (SCT).

5.5. Cross border arrangements

For the North East (Hume) Region, cross border arrangements exist with NSW SES, supported by a Memorandum of Understanding (MOU) that outlines how VICSES will request assistance from NSW SES as follows:

- In the case of an event within the immediate border area the relevant VICSES Regional Manager or delegate will request from the NSW SES Murray Region Controller or delegate such support as is required and notify the VICSES State Duty Officer (SDO).

- In the case of an event within Victoria but outside the immediate border area the VICSES Chief Officer Operations or delegate will request from NSW SES Commissioner or Delegate such additional support as is required.

In relation to flooding along the Murray River effective liaison and joint community messaging is essential. This should be facilitated by regular communication with NSW SES including the Hume REMT. ICCs that are managing Murray River flooding should request a NSW SES EMLO.

5.6. Regional Control Centre

The Region Response Plan will outline pre-determined facilities that are suitable for the establishment of a RCC for the management of emergency events, including for flood response, in North East (Hume) Region. These include:

- North East (Hume) RCC – DEWLP Office – 89 Sydney Road, Benalla.

5.7. Incident Control Centres

The Regional Response Plan will outline ICC locations that have been pre-determined for emergency response, including flood response, in the North East (Hume) Region. The ICCs that would be used for flood response are detailed in the table below.

The activation of the ICCs will be in line with the readiness arrangements outlined in JSOP 2.03 or the VICSES Flood Readiness and Activation Trigger Considerations (v3.0); refer to Attachment 7 – IMT Readiness Levels – Flood, and will be agreed by the RC and VICSES RAC, dependant on the location and scale of the flood event.

Name	Location	Catchments within footprint	Local Government Areas (LGAs) within footprint
Benalla ICC	64 Sydney Road, Benalla	North East Catchment & Goulburn Broken Catchment	All LGAs within Hume Region
Wangaratta ICC	1 Ely Street, Wangaratta	North East Catchment	Alpine, Indigo, Wangaratta
Wodonga ICC	Thomas Mitchel Drive, Wodonga	North East Catchment	Wodonga, Indigo, Towong
Shepparton ICC	195-205 Numurkah Road, Shepparton	Goulburn Broken Catchment	Moira, Shepparton, Benalla, Mansfield
Seymour ICC	36 McIntyre Street, Seymour	Goulburn Broken Catchment	Mitchell, Murrindindi, Strathbogie

5.8. Divisional Command Points

VICSES facilities equipped as Divisional Command Points (DCPs) and Country Fire Authority (CFA) facilities nominated as DCPs are listed in table below.

Location	VICSES units within footprint	LGAs within footprint
Benalla LHQ	Benalla, Mansfield	Benalla, Mansfield
Shepparton SAR	Shepparton SAR	Shepparton
Tatura LHQ	Tatura, Murchison,	Shepparton
Yarrawonga LHQ	Yarrawonga, Cobram	Moira
Yackandandah LHQ	Yackandandah, Beechworth, Bright, Myrtleford, Tallangatta	Indigo, Towong

Wodonga LHQ	Wodonga, Chiltern, Rutherglen, Corryong Tallangatta, Mitta Mitta	Wodonga, Indigo, Towong
Euroa LHQ	Euroa, Seymour, Alexandra, Kilmore	Strathbogie, Murrindindi, Mitchell
Wangaratta*	Wangaratta, Myrtleford, Bright	Wangaratta, Alpine
Yea CFA	Alexandra, Marysville, Kinglake	Murrindindi
Numurkah CFA	Numurkah	Moira

Further facilities suitable for use as DCPs for flooding are available from CFA. Local Command Facilities (LCFs) are equipped to DCP standard. Refer to Attachment 3 – Municipal Flood Emergency Plans (MFEPs) and Local Flood Guides for individual MFEPs likely to be used.

5.9. Regional resource requirements

Likely resource requirements for significant (major) flood events within each ICC footprint are detailed in Attachment 1 – Region Flood Scenarios.

Glossary

AEP	Annual Exceedance Probability
ARI	Average Recurrence Interval
BOM	Bureau of Meteorology
CERA	Community Emergency Risk Assessment
CFA	Country Fire Authority
CMA	Catchment Management Authority
DCP	Divisional Command Point
DELWP	Department of Environment, Land, Water and Planning
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
DET	Department of Education and Training
DoJ	Department of Justice
EM-COP	Emergency Management – Common Operating Picture
EMLO	Emergency Management Liaison Officer
EMMV	Emergency Management Manual Victoria
EMV	Emergency Management Victoria
EMT	Emergency Management Team
ENSO	El Nino – Southern Oscillation phenomena
EPA	Environment Protection Authority
ESTA	Emergency Services Telecommunications Authority
ICC	Incident Control Centre
IEMT	Incident Emergency Management Team
IMT	Incident Management Team
IOD	Indian Ocean Dipole
LCFs	Local Command Facilities
LFG	Local Flood Guide
LGA	Local Government Authority
MFB	Metropolitan Fire Brigade
MEMP	Municipal Emergency Management Plan
MFEP	Municipal Flood Emergency Plan
PTV	Public Transport Victoria
RAC	Regional Agency Commander
RC	Regional Controller
RCC	Regional Control Centre
RDO	Regional Duty Officer
REMT	Regional Emergency Management Team
RFA	Request for Assistance
SAC	State Agency Commander
SCC	State Control Centre
SCOT	State Coordination Team
SCRC	State Crisis and Resilience Council

SCT	State Control Team
SDO	State Duty Officer
SEMC	Security and Emergency Management Committee of Cabinet
SEMT	State Emergency Management Team
SERP	State Emergency Response Plan
SWRT	Swift Water Rescue Team
USAR	Urban Search and Rescue
VICSES	Victoria State Emergency Service
VICPOL	Victoria Police

Attachments

Attachment 1 – Region Flood Scenarios

Region flood scenarios have been developed to support periodic training requirements (outlined in Section 1.8), provide opportunity to document anecdotal and/ or known flood impacts based on historic events, and provide an indication of the resource requirements and associated gaps for operational response.

The below scenarios provide examples of likely flood events in the North East (Hume) Region and are based on likely flood events of varying intensity.

Scenario 1

The 2012 flood events occurred when already saturated catchments received 300mm of rain from several large storms out of a decaying tropical cyclone. Flash flooding led to riverine flooding, particularly across the Goulburn Broken Catchment.

Scenario 2

The 2010 flood events saw riverine flooding caused by sequences of warm fronts (caused by the Madden-Julian oscillation and Southern Ocean fronts) during winter and spring, bringing wind and warm rain that progressively wet up the catchments and filled the natural floodplain storage, compounded by snowmelt from alpine areas.

Scenario 3

Failure of large dams could cause significant flooding (e.g. Snowy Hydro, Hume, Dartmouth, Khancoban Pondage and Lake William Hovell). In December 2010 the Mannus Dam failed in NSW causing an unexpected and unexplained second peak to major level floods and resulting in the evacuation of parts of Walwa. See Section 2.5 for list of dams and refer to appropriate Dam Safety Emergency Plans.

Resource Requirements

The table below provides a list of resource requirements that have been identified to support operational response to a significant flood event, as outlined in the scenarios above, within the North East (Hume) Region. A full list of North East (Hume) Region resources is available in Attachment 4 – Regional Resources.

Additional regional multi-agency resources may be accessed during operations through the AIIMS structure and escalated to State as required.

Core Capability	Human Resources	Equipment
Swift Water Rescue (in water)	Swift Water Rescue Team (SWRT) from VICPOL or MFB	-
Aerial observations	-	Unmanned aerial vehicle or rotary aircraft
Hydrology / flood expert	Hydrologists	-
Sandbag filling teams	Department of Justice (DoJ) work crews	-
Impact Assessment Teams	-	-

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 – Flood Sub-plan.

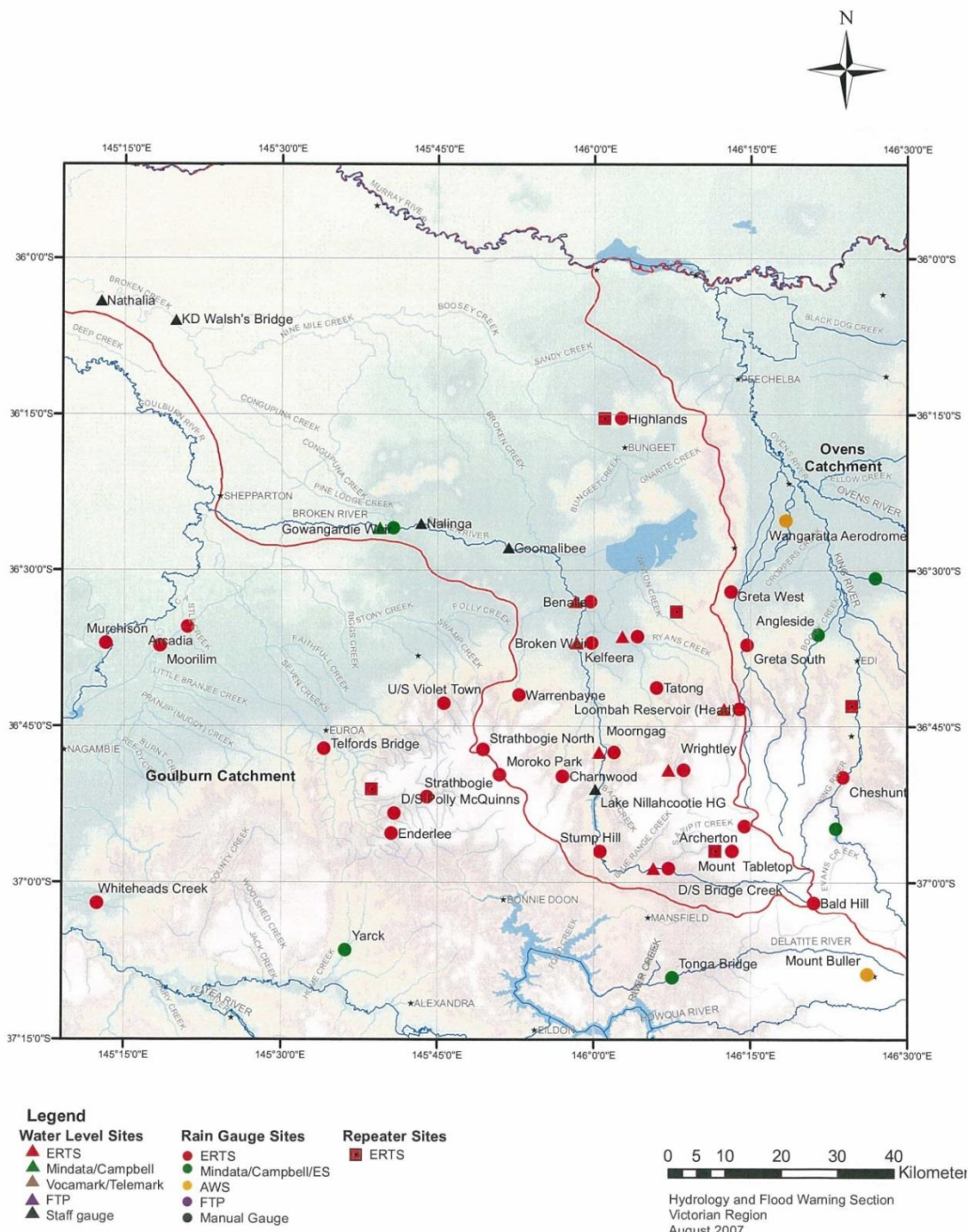
Attachment 2 – Catchments and flood gauges

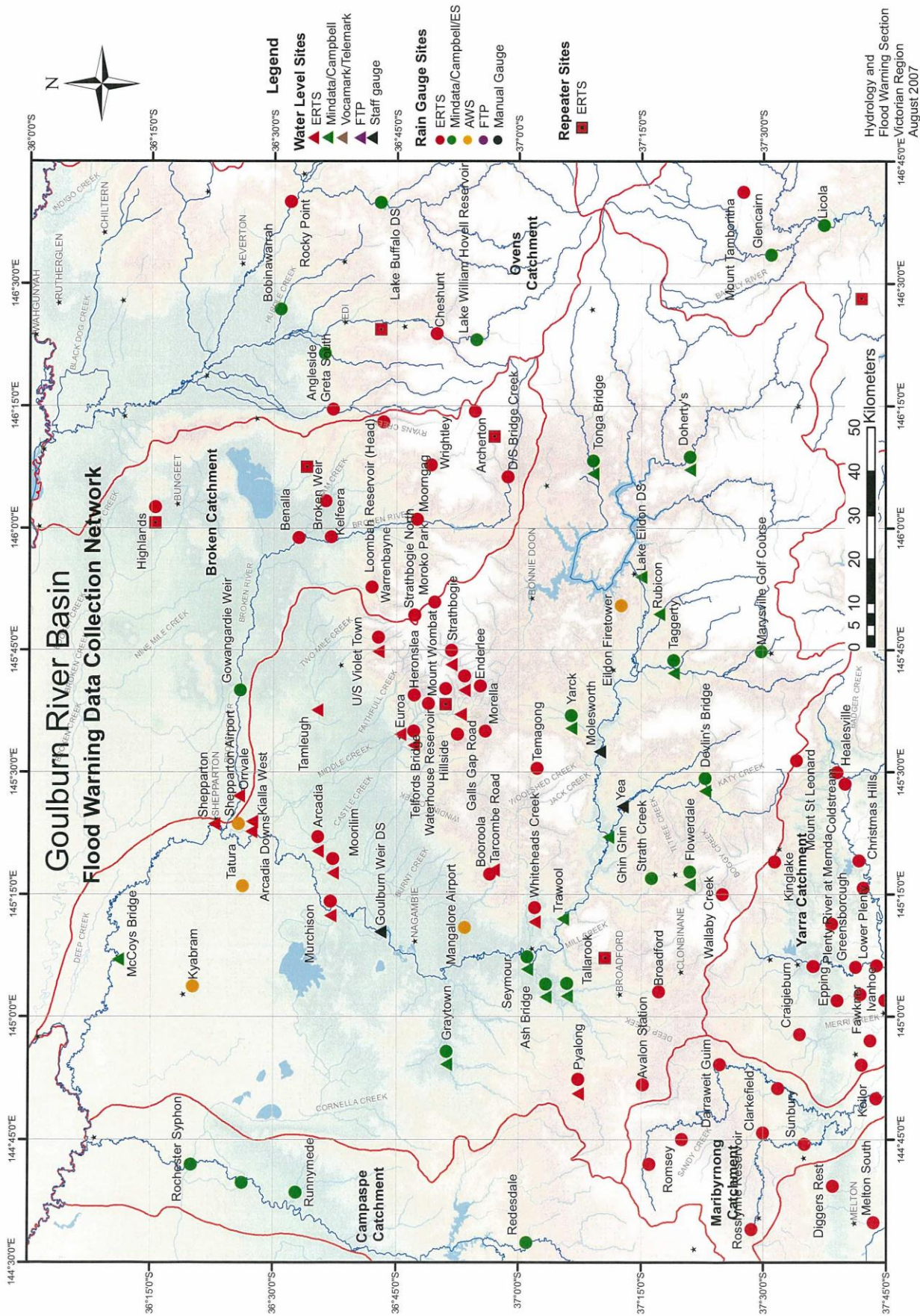
The North East (Hume) Region catchment maps and associated monitored flood gauges have been provided by BOM, and were last updated in 2013.

For further information please refer to the following links:

- FloodZoom – <https://www.floodzoom.vic.gov.au/FIP.Site/map>
- Bureau of Meteorology – http://www.bom.gov.au/vic/flood/rain_river.shtml

Broken River Basin Flood Warning Data Collection Network

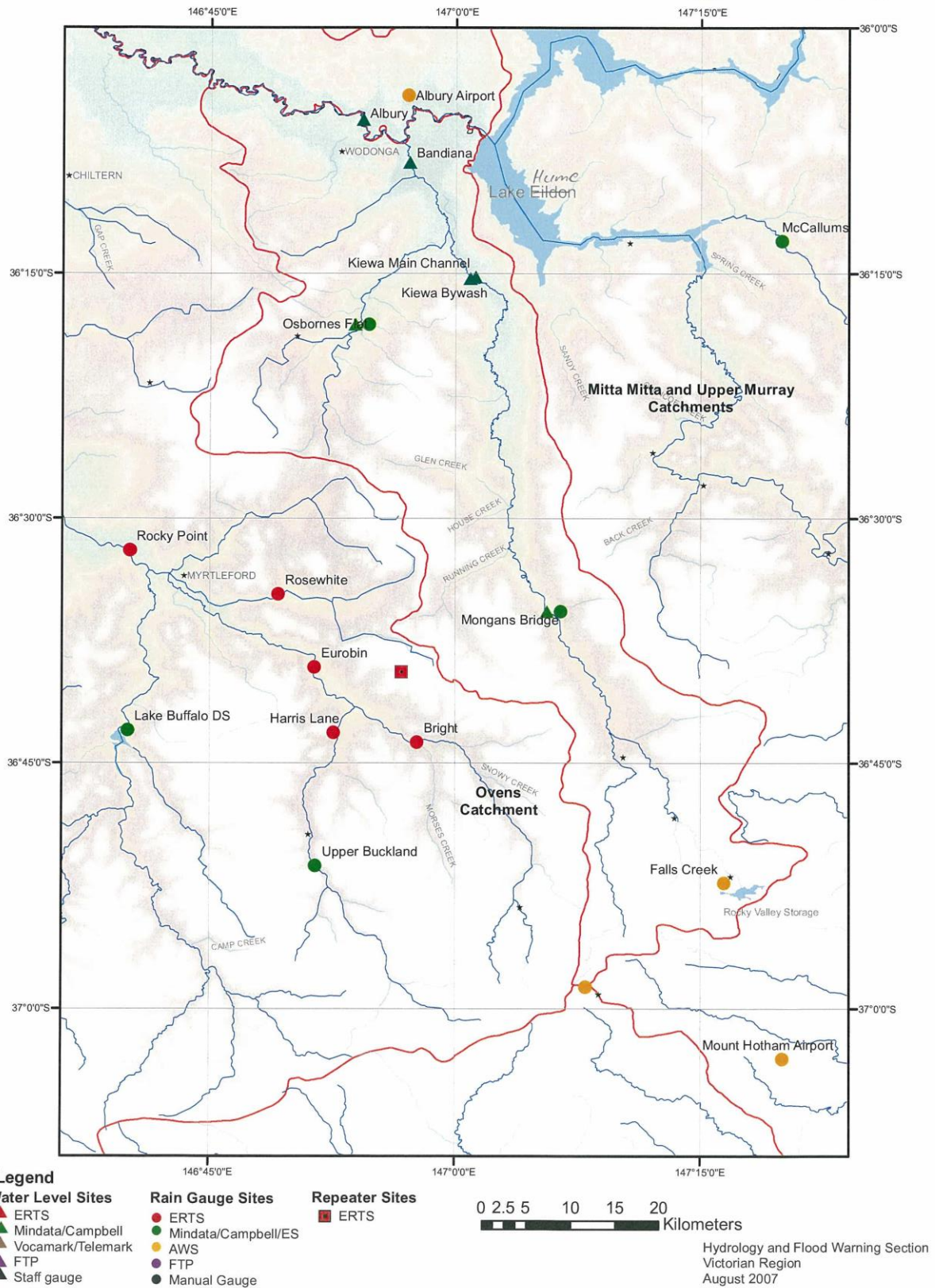




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August 2007

Kiewa River Basin

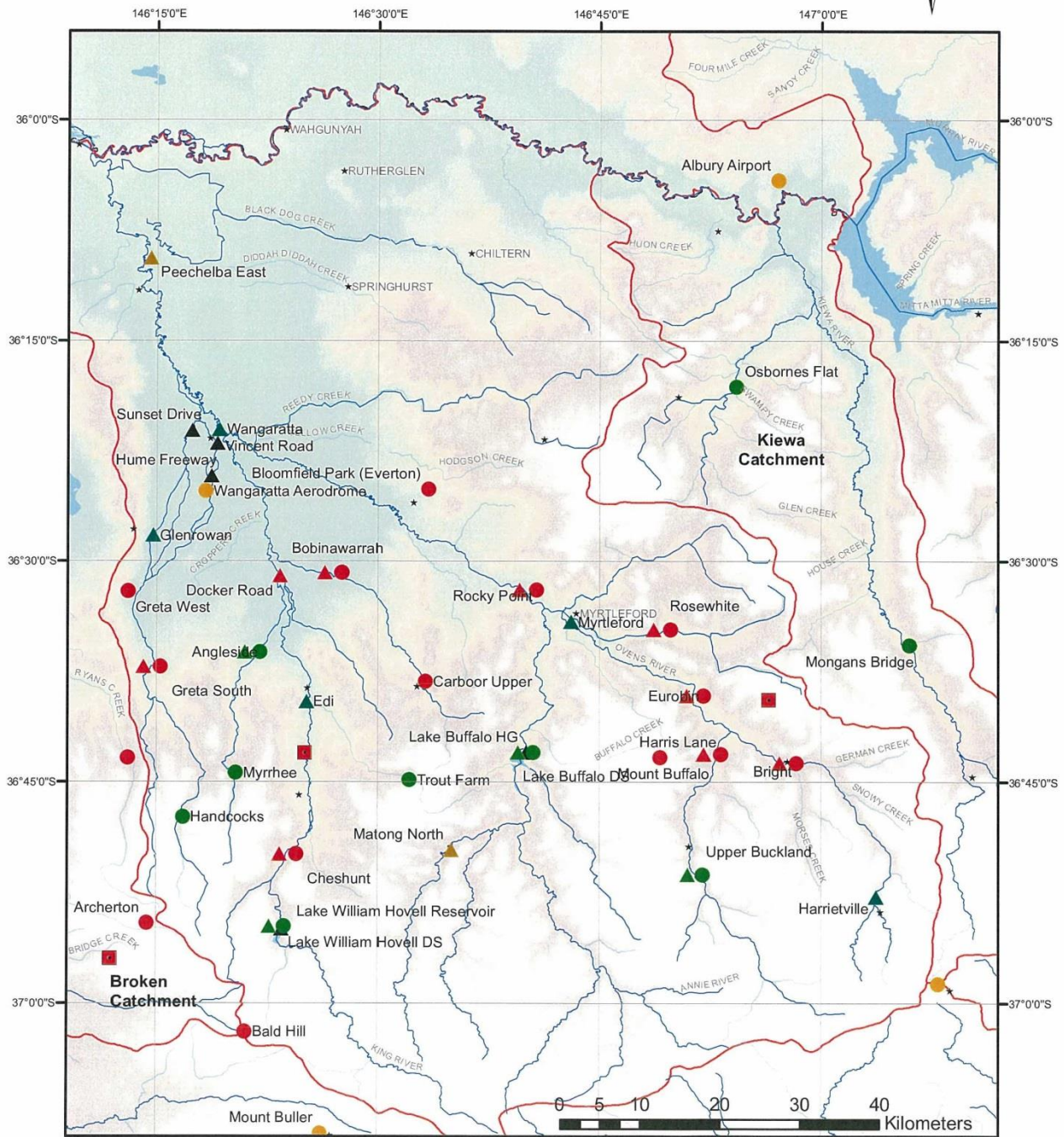
Flood Warning Data Collection Network



Ovens and King Rivers Flood Warning Data Collection Network



Australian Government
Bureau of Meteorology

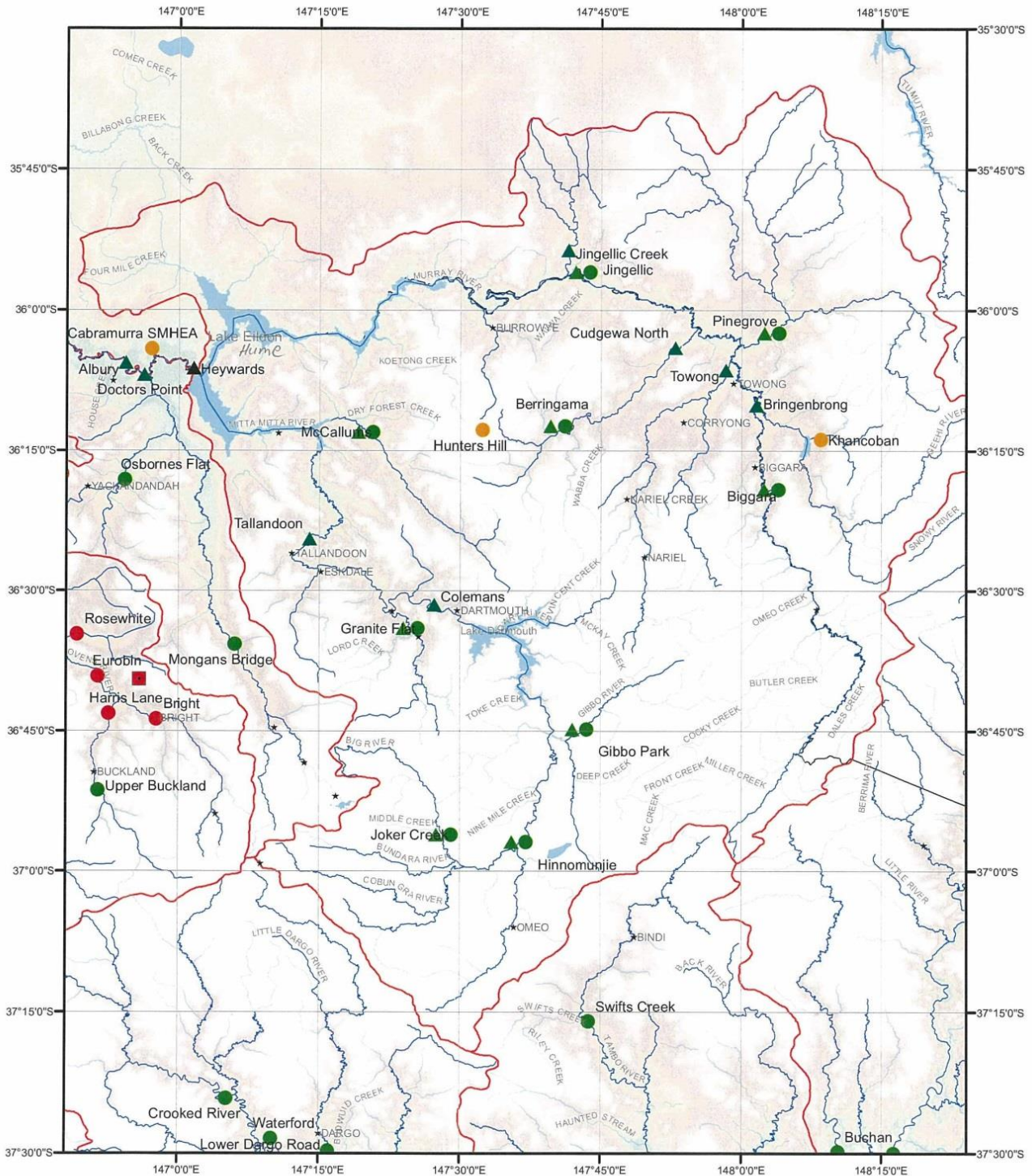


Legend

- | Water Level Sites | Rain Gauge Sites | Repeater Sites |
|---------------------|-----------------------|----------------|
| ▲ ERTS | ● ERTS | ■ ERTS |
| ▲ Mindata/Campbell | ● Mindata/Campbell/ES | |
| ▲ Vocamark/Telemark | ● AWS | |
| ▲ FTP | ● FTP | |
| ▲ Staff gauge | ● Manual Gauge | |

Hydrology and Flood Warning Section
Victorian Region
August 2007

Upper Murray and Mitta Mitta Rivers Flood Warning Data Collection Network



Legend

Water Level Sites

- ▲ ERTS
- ▲ Mindata/Campbell
- ▲ Vocamark/Telemark
- ▲ FTP
- ▲ Staff gauge

Rain Gauge Sites

- ERTS
- Mindata/Campbell/ES
- AWS
- FTP
- Manual Gauge

Repeater Sites

- ERTS



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Attachment 3 – Municipal Flood Emergency Plans (MFEPs) and Local Flood Guides

All local flood guides are published at: www.ses.vic.gov.au/get-ready/your-local-flood-information and in FloodZoom – <https://www.floodzoom.vic.gov.au>.

Local Government Area (LGA) with MFEPs	Local Flood Guides (LFGs)
Alpine Shire	Myrtleford
Benalla Rural City	Benalla
City of Wodonga	N/A
Greater Shepparton	Congupna Katandra West Mooroopna & Shepparton Murchison Tallygaroopna
Indigo Shire	N/A
Mansfield Shire	Jamieson
Mitchell Shire	Seymour
Moira Shire	Katamatite Nathalia Numurkah Muckatah Depression Fact Sheet Tungamah
Murrindindi Shire	Yea
Rural City of Wangaratta	Wangaratta
Strathbogie Shire	Violet Town
Towong Shire	Upper Murray & Gauge Supplement

Attachment 4 – Regional Resources

The table below outlines the resources available for response held by the 26 regional VICSES units. See relevant MFEP for more detail and the VICSES unit map (Attachment 5).

Unit Name	Primary Vehicle/s	Support Vehicle/s	4WDs	Boats	Trailers
Alexandra	Primary Rescue	-	4WD x 2	Rescue Boat	Storm Trailer
Beechworth	Primary Rescue	-	4WD	-	Storm Trailer
Benalla	Primary Rescue	Storm/ rescue support	4WD x 2	Rescue Boat x2	Storm Trailer
Bright	Primary Rescue	-	4WD x 2	-	Storm Trailer x2
Chiltern	-	-	4WD x 2	-	Storm Trailer
Cobram	Primary Rescue	-	4WD	Rescue Boat	Storm Trailer
Corryong	Primary Rescue	-	4WD	-	Storm Trailer
Euroa	Primary Rescue	-	4WD x 2	-	Storm Trailer
Falls Creek	-	-	4WD	-	-
Kilmore	Primary Rescue	Storm/ rescue support	4WD x 2	-	-
Kinglake	Primary Rescue	Storm/ rescue support	4WD x 2	-	Storm Trailer
Mansfield	Primary Rescue	-	4WD x 2	Rescue Boat	Storm Trailer
Marysville	Primary Rescue	-	4WD x 2	-	Storm Trailer
Mitta Mitta	Primary Rescue	-	4WD	-	Storm Trailer
Murchison	Primary Rescue	-	4WD	-	Storm Trailer
Myrtleford	Primary Rescue	-	4WD	-	Storm Trailer
Numurkah	Primary Rescue	Storm/ rescue support	4WD	Rescue Boat	-
Rutherglen	Primary Rescue	-	4WD	-	Storm Trailer
Seymour	Primary Rescue	-	4WD x 2	Rescue Boat x2	Storm Trailer
Tallangatta	Primary Rescue	-	4WD x 2	Rescue Boat x2	Storm Trailer
Tatura	Primary Rescue	-	4WD x 2	Rescue Boat	Storm Trailer
Wangaratta	Primary Rescue	Storm/ rescue support	4WD	Rescue Boat	Storm Trailer
Wodonga	Primary Rescue	Storm/ rescue support	4WD x 1 and Van (12 seater)	Rescue Boat x2	Storm Trailer
Yackandandah	-	Storm/ rescue support	4WD x 1	-	-
Yarrawonga	Primary Rescue	-	4WD x 2	Rescue Boat x2	Storm Trailer

All requests for such resources should be made via the relevant RAC.

In addition to the unit resources listed above the following VICSES regional strategic resources and composite teams are available.

- 1 x Field Operation Vehicle
- 1 x Logistics Truck (with staging area or base camp equipment)
- 5 x Lighting Towers
- 7 x Snow Mobiles

- 1 x Sandbag Filling Trailer
- 1 x Urban Search and Rescue (USAR) Trailer
- 1 x High Angle Rescue Cache
- Land Based SWRT
- Alpine Search and Survival Team
- Technical Rescue Team

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

- IMT personnel
- Chainsaw Crews
- Arborists
- Initial Impact Assessment Teams
- Base Camp Teams
- Staging Area Teams
- Health Monitoring units

The region also holds strategic reserves of sandbags at the following locations. In addition, VICSES maintains small community sandbag caches listed in the relevant MFEPs. The figures below refer to nominal amounts stored subject to refurbishment after an event.

Unit Name	Primary Contact Person	Quantities (refers to individual sandbags)
Alexandra	VICSES Regional Duty Officer	2,500
Beechworth	VICSES Regional Duty Officer	3,000
Benalla	VICSES Regional Duty Officer	9,000
Bright	VICSES Regional Duty Officer	5,000
Chiltern	VICSES Regional Duty Officer	350
Cobram	VICSES Regional Duty Officer	1,500
Corryong	VICSES Regional Duty Officer	100
Euroa	VICSES Regional Duty Officer	8,000
Falls Creek	VICSES Regional Duty Officer	100
Kilmore	VICSES Regional Duty Officer	2,000
Kinglake	VICSES Regional Duty Officer	500
Mansfield	VICSES Regional Duty Officer	1,000
Marysville	VICSES Regional Duty Officer	500
Mitta Mitta	VICSES Regional Duty Officer	50
Murchison	VICSES Regional Duty Officer	2,000
Myrtleford	VICSES Regional Duty Officer	10,000
Numurkah	VICSES Regional Duty Officer	10,000
Rutherglen	VICSES Regional Duty Officer	3,000
Seymour	VICSES Regional Duty Officer	15,000
Shepp SAR	VICSES Regional Duty Officer	5,000
Tallangatta	VICSES Regional Duty Officer	2,500
Tatura	VICSES Regional Duty Officer	2,500
Wangaratta	VICSES Regional Duty Officer	6,000
Wodonga	VICSES Regional Duty Officer	8,000
Yackandandah	VICSES Regional Duty Officer	2,000

Yarrawonga	VICSES Regional Duty Officer	8,000
Wodonga CFA ICC	CFA Duty Officer	32,000
Nathalia Council Works Depot	Moira Shire MERO	10,000
NE RHQ	VICSES Regional Duty Officer	80,000

Sand supplies are available from the following suppliers in the region.

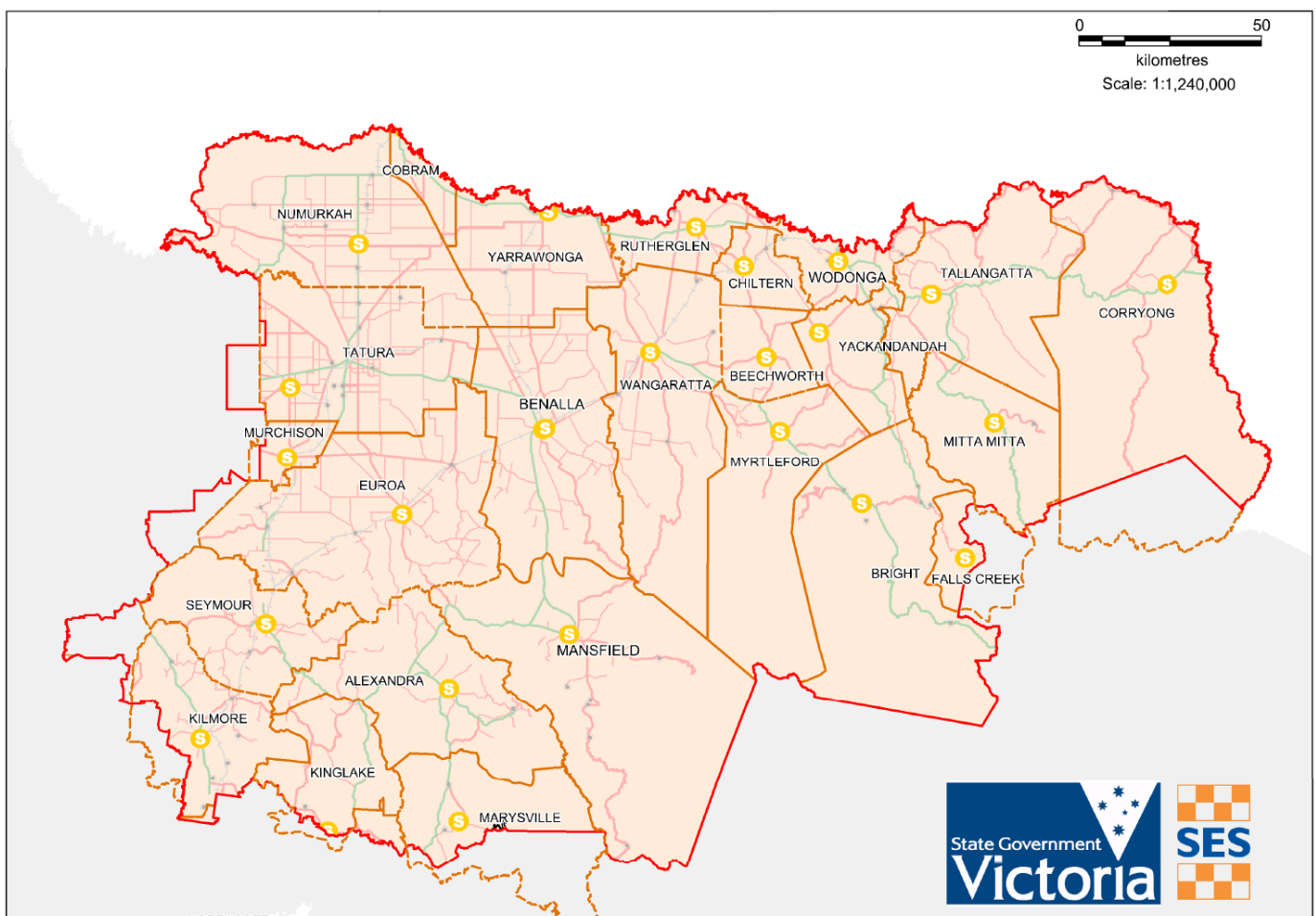
Company Name	Address	24 HR Access	BH Number	Contact Name	AH Number	Approx. Quant. on site	Supplier in area
Bedrock Garden Supplies	2 Rose Street, Alexandra VIC 3714	YES	03 5772 1911	David Leary	0447 788 018	30m ³	Alexandra
Beechworth Sand & Soil	1617 Diffey Road, Beechworth VIC 3747	YES	03 5728 3193	Evan Taylor	0419 266 771	10m ³	Beechworth
Green 'n' Grow	139 Grant Drive Benalla Vic 3672	Up To 8PM	03 5762 2296	Christine Carter	0417 350 110	30m ³	Benalla
Adornato Sand & Gravel Supplies	Numurkah Rd, Shepparton VIC 3632	YES	03 5831 4392	Ross Adornato	0418 334 683	600m	Murchison
							Numurkah
							Tatura
							Shepp SAR
Wodonga Sand and Soil	162 Victoria Cross Parade, Wodonga VIC 3690	YES	02 6056 3355	Michael Cheshire	0407 789 005	20m ³	Wodonga
							Tallangatta
							Chiltern
							Corryong
							Mitta Mitta
							Rutherglen
Mawsons	110-112 Wimble Street Seymour 3661	YES	03 5799 2355	Darren Crook	0427 048 955	100m ³	Seymour
							Euroa
Northern Garden Supplies	30 Willowmavin Rd, Kilmore VIC 3764	YES	03 5781 1588	Claude Pannunzio	0427 788 393	100m ³	Kilmore
							Kinglake
							Marysville
McPhersons Earthmoving Contractors	17 McGeehan Crst, Myrtleford VIC 3737	YES	03 5752 2333	Craig McPherson	0427 326 897	50m ³	Bright
							Myrtleford
Toil and Soil Garden Supplies	2/14 Provis St, Wangaratta VIC 3677	YES	03 5722 2220	John Gollin	0429 945 509	TBC	Wangaratta
J W & R P Payne - Sand and Soil	6 Lucan St, Mulwala NSW 2647	YES	03 5744 3800	John Payne	0428 576 423	1000m ³	Yarrawonga
Alpine Garden Supplies	261 Dead Horse Ln, Mansfield VIC 3722	YES	03 5775 2924	Ben Kipping	0400 877 582	10m ³	Mansfield

Attachment 5 – VICSES unit map

Units within the North East (Hume) Region include:

- Alexandra
- Beechworth
- Benalla
- Bright
- Chiltern
- Cobram
- RSU
- Falls Creek
- Kilmore
- Kinglake
- Mansfield
- Marysville
- Mitta Mitta
- Euroa
- Numurkah
- Rutherglen
- Tatura
- Wodonga
- Yarrawonga
- Myrtleford
- Seymour
- Tallangatta
- Wangaratta
- Yackandandah
- Corryong

A map of VICSES units within the North East (Hume) Region is provided below.



Map of VICSES units within North East (Hume) Region
Source: BMT WBM Pty Ltd

Attachment 6 – Flood history and possible consequences

A list of known flood events and associated consequences is provided in the tables below. Where gaps in data or information exist due to incomplete record keeping for historic events, this is identified by use of a symbol (-).

Alpine Shire Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	Ovens River	-	-	-
1870 “The Great Flood”	Ovens River	150-200	0.6 – 0.5	-
1917	Kiewa River	-	-	Kiewa impacted
	Ovens River	50	2	-
May 1974	Kiewa river	40	2.5	Kiewa impacted
	Ovens River	30	3.3	Myrtleford
Oct 1993	Ovens River	100-120	1-0.8	7.1m at Eurobin. At Myrtleford 122 buildings flood.
Sept 1998	Buffalo River	25	4	Lake Buffalo
	Kiewa River	> 100	>1	Largest flood on record.
	Ovens River	45	2.2	Bright . Significant flash flooding along Upper Ovens River. 6.9 m at Eurobin. 112 buildings flood in Myrtleford.
		50	2	Rocky Point (near Whorouly)
Sept 2010	Ovens River	-	-	6.83m at Eurobin (Myrtleford)
Dec 2010	Ovens River	-	-	5.73m at Eurobin (Myrtleford)
Mar 2012	-	-	-	4.79m at Eurobin
Oct 2016	Ovens River	-	-	<p>6.19m at Eurobin</p> <p>16 Landslides between Mt Beauty and Falls Creek.</p> <p>Evacuation issued for low lying parts of Myrtleford.</p> <p>Moderate at Ovens: Bright, Rocky Point. Buckland: Harris La, Buffalo at Lake Buffalo.</p> <p>from TL: At 5.2 m +:Impacts in Myrtleford could be expected to commence shortly:</p> <ul style="list-style-type: none"> ▪ Closure of Lewis Ave, Standish St, Selzers La, & Great Alpine Road at Wabonga La. ▪ Flooding at the rear / carpark of IGA and possibly around scout hall. ▪ Breakout over Whalley’s Lane downstream of diversion channel and then through Maude Street area. ▪ Potential overtopping or backwater flooding behind the levee at Arderns Caravan Park. ▪ Possible impacts in the lower parts of the Myrtleford Caravan Park.

Benalla Rural City Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1870 "The Great Flood"	-	-	-	-
1916	Broken River	~100	-	5.69m at Benalla (pre Benalla Lake).
1917	Broken River	~100	-	4.97m at Benalla (pre Benalla Lake).
1954	Broken River	-	-	4.57m at Benalla.
1966	Broken River	-	-	4.57m at Benalla.
May 1974	-	-	-	-
Oct 1993	Broken River	100	1	5.5m at Benalla, highest flood in 120 years. 1,100 buildings could see overfloor flooding. 6.57 m at Gowangardie Weir.
Sept 1998	-	-	-	-
Sept 2010	Broken River	20	-	4.26m at Benalla. People displaced in Benalla.
Mar 2012	Broken Creek	-	-	Flooding caused by several large storms. Rain gauges measured in excess of 300mm of rain over three days.

Indigo Shire Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1870 "The Great Flood"	-	-	-	-
1917	Murray River	100	1	Albury, Corowa, Yarrawonga, Cobram.
May 1974	-	-	-	-
Oct 1975	Murray River	35	2.8	Albury, Corowa, Yarrawonga.
Oct 1993	-	-	-	-
Sept 1998	-	-	-	-
Sept 2010	-	-	-	-
Mar 2012	-	-	-	-

Mansfield Shire Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1870 "The Great Flood"	Goulburn River	50	2	-
1916	Goulburn River	100	1	Largest flood in the 20 th Century.
1917	Goulburn River	>100	-	Eildon (pre dam).
1934	Goulburn River	100	-	Eildon to Molesworth.
May 1974	Jamieson River	-	-	Jamieson: 3.58 m at Doherty's.

Oct 1975	Delatite River	~100	-	-
	Ford Creek	~100	Mans field	At 4.66m some buildings in Jamieson flood.
Oct 1993	-	-	-	-
Sept 1998	Jamieson River	40	2.5	Flash flooding Jamieson area.
June 2007	Jamieson River /Goulburn river	-	-	-
Sept 2010	Goulburn River	-	-	At 5.33m Jamieson 27 buildings flooded, town was isolated.
	Delatite River	>50	-	Second largest on record.
Mar 2012		-	-	-

Mitchell Shire Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1870 "The Great Flood"	Goulburn River	50	2	-
1916	Goulburn River	100	1	Largest flood in the 20 th Century . Seymour CBD moved for the third time due to floods. Floodwater over 2 m deep over GV Hwy and Kings park.
1934	Goulburn River	100	-	Eildon to Molesworth. 11.25m at Seymour.
Feb 1973	Whiteheads Creek	>100	>1	One drowning and one house washed away. Severe storm caused flash flooding from Yea to Seymour.
May 1974	Goulburn River	70	-	7.64m at Seymour, water over 1m deep GVHwy/Kings Park.
	Sunday Creek	30	-	Seymour
Oct 1975	Goulburn River	-	-	7.03 m at Seymour, water 1m deep GVHwy/Kings Park.
Jun 1989	King Parrot Creek	~50	-	Flowerdale
Oct 1993	Goulburn River	-	-	-
Sept 1998	Acheron River	-	-	Buxton to Taggerty
Sept 2010	Goulburn River	~100	-	-
	Acheron River	-	-	Buxton to Taggerty. Largest flood on record.
Mar 2012	-	-	-	-
2016	Whiteheads Creek	-	-	One drowning, multiple rescues from floodwater.

Moira Shire Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1867	Murray River	90	1.1	Significant impacts in Albury and further downstream.
1870 "The Great"	Murray River	150	0.6	Largest known flood in the Murray catchment,from the Upper Murray to Yarrawonga and downstream. Record flood

Flood”				heights in Echuca.
	Goulburn River	>100	1%	at Shepparton, 600mm higher than 1916 flood.
1916	Murray River	100	1	At Echuca, largest flood in 20 th Century.
	Broken Creek	~100	-	Katamatite to Nathalia. Note before flood infrastructure. 107.9 m at Numurkah.
1917	Murray River	100	1	Albury, Corowa, Yarrawonga, Cobram. At Cobram Levees breached. Below Barmah much less impact as most flow diverts north into NSW effluents. Murray flooding spreads back into the Broken Creek system.
1939	Broken Creek	-	-	107.18m at Numurkah.
Feb 1973	-	-	-	
May 1974	Broken Creek	100	-	3.25m Walshs Bridge Nathalia. 107.8m at Numurkah. Flooding lasted 2 weeks. Business and residential areas flooded.
	Boosey Creek	-	-	2.8m at Tungamah.
Oct 1975	Murray River	35	2.8	Albury, Corowa, Yarrawonga, Cobram.
	Boosey Creek	-	-	2.46m at Tungamah.
Oct 1993	Broken River	100	1	Downstream of Benalla area.
	Broken Creek	40	2.5	3.50m at Walshs Bridge Nathalia. 107.77m at Numurkah.
	Boosey Creek	-	-	2.73m at Tungamah.
Sept 1998	-	-	-	-
Sept 2010	Broken Creek	-	-	Parts of Nathalia evacuated.
	Goulburn River	-	-	Goulburn, Broken and Seven creeks all peaking at major levels.
Mar 2012	Broken Creek	~100	-	Ranked largest flood on record. Overland flooding largely from direct rainfall in excess of 300mm of rain over three days. Widespread Flooding across Moira Shire including: Congupna, Nathalia, Numurkah, Katamatite, Wunghnu, Muckatah, Katunga. At 3.57m Walshes Bridge Nathalia, 17 houses outside levees flood. At 107.9m in Numurkah, 160 buildings above floor flooding. Floodwater from Muckatah Depression added to flooding.

Murrindindi Shire Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1867	-	-	-	-
1870 “The Great Flood”	Goulburn River	50	2	-
1916	Goulburn River	~100	-	Largest flood in the 20 th Century – generally Molesworth to the Murray. Eildon 1%.
1917	-	-	-	-
1934	Yea River	100	1	Yea area 4.55m
Feb 1973	Yea River	>100	>1	Yea: overland storm flooding. Seymour, one drowning and one house washed away. Severe storm caused flash flooding from Yea

				to Seymour.
May 1974	Yea River	-	-	4.45m at Yea (est)
Oct 1975	UT Creek	~100	-	Alexandra
1989	Yea River	30	3.3	Yea 4.16m
	King Parrot Creek	~50	-	Flowerdale
Oct 1993	-	-	-	-
Sept 1998	Acheron River	-	-	Buxton to Taggerty.
Sept 2010	Acheron River	-	Largest flood on record.	Buxton to Taggerty.
Mar 2012	-	-	-	-

Shepparton Greater City Council Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1867	-	-	-	-
1870 "The Great Flood"	Goulburn River	>100	1	At Shepparton, 600mm higher than 1916 flood.
1916	Goulburn River	>100	1	Largest flood in the 20 th Century – Murchison, Main Street flooded to 1m depth. 12.25m (est) at Shepparton.
1917	Goulburn River	>100	-	11.28m at Murchison.
1939	Goulburn River	50	2	Shepparton. 10.79m at Murchison.
Feb 1973		-	-	-
May 1974	Goulburn River	70	1.4	12.09 m at Shepparton – Mooroopna completely cut off. 11.33m at Murchison. 12.10m at Arcadia Downs.
	Broken River	-	-	8.33 m at Orrvale. 4.28m at Tallygaroopna.
	Seven Creeks	-	-	7.85m at Kialla West.
Oct 1975	-	-	-	-
1989	-	-	-	-
Oct 1993	Lower Goulburn	-	-	Statewide damage for this event exceeded \$320million including homes, business, infrastructure, agricultural assets and utilities.
	Goulburn River	-	-	11.71m at Shepparton.
	Broken River	100	-	At Benalla, highest flood in 120 years 8.44m at Orrvale. 5.51m at Tallygaroopna.
Sept 1998	-	-	-	-
Sept 2010	Goulburn River	~100	-	11.09m neutral riverine flood (in Shepparton-Mooroopna area) involving Goulburn, Broken and Seven creeks peaking at major levels. 10.81m at Arcadia Downs.
	Broken River	-	-	8.21m at Orrvale. 4.26m at Tallygaroopna.
	Seven Creeks	-	-	6.6m at Kialla West.
Mar 2012	Overland flooding	>100	-	Shepparton East area.
2016	-	-	-	-

Strathbogie Shire Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1867	-	-	-	-
1870 "The Great Flood"	-	-	-	-
1916	Honeysuckle Creek	-	-	Violet Town's largest flood.
	Seven Creeks	100	-	Euroa
1917	-	-	-	-
1939	-	-	-	-
Feb 1973	-	-	-	-
May 1974	-	-	-	-
Oct 1975	-	-	-	-
Jun 1989	King Parrot Creek	~50	-	Flowerdale
Oct 1993	Honeysuckle Creek and Lambing Gunyah	~100	-	At Violet Town 40 properties flooded (63 likely to flood today). Widespread rural flooding. The railway line often acts as a flood levee increasing flooding on south side of the line.
	Seven Creeks	40	-	Euroa
Sept 1998	Acheron River	-	-	Buxton to Taggerty.
Sept 2010	Honeysuckle Creek	-	-	Parts of the town evacuated.
	Acheron River	-	-	Buxton to Taggerty. Largest flood on record.
	Seven Creeks	20	-	People displaced in Euroa. 1.27m at Boho R/F gauge.
Oct 2010	Honeysuckle Creek	-	-	Violet Town, 1.58m at Boho R/F Gauge.
Mar 2012	-	-	-	-
2013 (?)	Long Gully Creek	~100	-	Violet Town
2016	-	-	-	-

Towong Shire Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1867	Murray River	90	1.1	Significant impacts in Albury
1870 "The Great Flood"	Murray River	150	0.6	Largest known flood in the Murray catchment Upper Murray to Yarrawonga.
1916	Murray River	100	1	At Echuca.
1917	Murray River	100	1	Albury, Corowa, (pre Hume Dam).
1934	Murray River	-	-	7.01 m at Jingellic.
1955	Mitta Mitta River	65	1.5	Tallandoon, largest on record.
Feb 1973	-	-	-	-
May 1974	Murray River	-	-	7.51m at Jingellic.
Oct 1975	Murray River	35	2.8	Albury, Corowa, (post Hume Dam) Several rural levees breached. 7.32m at Jingellic.
	Tooma River	-	-	3.68m at Pinegrove.
1989	-	-	-	-
Oct 1993	-	-	-	-
	-	-	-	-
Sept 1998	Mitta Mitta River	50	2	Hinnomunjie upstream of Dartmouth.
	Upper Murray river	-	-	3.01m at Biggera.
	Corryong Creek	-	-	3.69 m at Towong.
	Cudgewa Creek	-	-	3.59m at Berringama.
Mar 2012	Upper Murray	-	-	Flooding caused by several large storms with heavy rainfall from a decaying tropical cyclone in Northern Australia. At 7.91m at Jingellic parts of Walwa evacuated, 1 house and Caravan Park flooded. 3.36m at Biggera. 3.67 m at Bringenbrong.
	Corryong Ck	-	-	3.76m at Corryong Ck.
	Jingellic Creek	-	-	4.5m at Jingellic.
	Cudgewa Creek	-	-	3.98m at Berringama, 2.89 m at Cudgewa North.
	Tooma River	-	-	3.81m at Pinegrove.
2016	Murray River downstream of Hume Weir	-	-	Major flooding in parts of Albury and Corowa after significant dam releases.

Wangaratta Rural City Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	Ovens River	-	-	Significant impacts in Wangaratta.
1867	Murray River area	90	1.1	Significant impacts in Albury and Wangaratta.
1870 "The Great Flood"	Ovens River	150-200	0.6 – 0.5	Significant impacts in Wangaratta.
1916	-	-	-	-
1917	Ovens River	50	2	12.98m at Wangaratta, 14 June, 6 fatalities ² .
	Murray River area	100	1	Yarrowonga area.
1955	-	-	-	-
Feb 1973	-	-	-	-
May 1974	Ovens River	55	1.8	12.8m at Wangaratta, more than 260 homes flooded (pre levees and diversion channel).
	Ovens River	30	3.3	Myrtleford
	15 Mile Creek	-	-	5.73m at Great South.
Oct 1975	Murray River area	35	2.8	Albury to Yarrowonga.
1989	-	-	-	-
Oct 1993	Ovens River	100-120	1-0.8	12.98m at Wangaratta.
	King River	-	-	King Valley into Wangaratta.
	15 Mile Creek (including 1&3 Mile Creeks)	-	-	8.54m at Greta Sth. In Wangaratta 53 homes flooded.
Sept 1998	Ovens River	50	2	Rocky Point (Whorouly area).
	Ovens River	40	2.5	12.77m at Wangaratta
	King River	25	4	Docker Road.
Sept 2010	Ovens River	-	-	12.8m at Wangaratta.
	King River	-	-	-
Dec 2010	Ovens River	-	-	12.76m at Wangaratta.
	15 Mile Creek	-	-	5.96m at Great South.
Mar 2012	-	-	-	-
2015	Ovens & King Rivers	-	-	Saturated catchments resulted in significant riverine flooding with sustained rain and snowmelt.
2016	Ovens River	-	-	Major at Wangaratta resulting in levee safety emergency.

² Refer to "Flood Tragedy June 1917", NECMA Snap Shot Source: Myrtleford Mail and Whorouly Witness (Vic. : 1914 - 1918), Thursday 14 June 1917, page 8.

Wodonga City of Flood History

Year	Primary Catchment(s) impacted	ARI or height if known	AEP %	Description
1854	-	-	-	-
1867	Murray River area	90	1.1	Significant impacts in Albury
1870 "The Great Flood"	Murray River	150	0.6	Largest known flood in the Murray catchment: Upper Murray to Yarrawonga and downstream. record flood heights in Echuca.
1916	Murray River	100	1	Largest in 20 th Century.
1917	Kiewa River	unknown	-	Kiewa
	Murray River area	100	1	Albury to Corowa and D/S.
1955	-	-	-	-
Feb 1973	-	-	-	-
May 1974	Kiewa river	40	2.5	Kiewa
Oct 1975	Murray River area	35	2.8	Albury to Corowa and D/S.
1989	-	-	-	-
Oct 1993	Murray River area	-	-	-
Sept 1998	Kiewa River	> 100	>1	Largest flood on record.
	Mitta Mitta River	50	-	Hinnomunjie upstream of Dartmouth.
Sept 2010	-	-	-	-
Mar 2012	-	-	-	-
2016	Murray downstream of Hume Weir	-	-	Flooding below dam due to dam releases to create airspace. Saturated catchments resulted in significant riverine flooding with sustained rain and snowmelt. Major impact and inundation of sand quarries in the floodplain at Wodonga.

Attachment 7 – IMT Readiness Levels – Flood

JSOP 2.03 – Incident Management Team (IMT) Readiness Arrangements

Schedule 6 IMT Readiness Levels – Flood

To determine the readiness level required, all three riverine flood conditions (FCL) described in the table below are needed to be predicted for 50% or more of an ICC footprint. Each river catchment, the upper and lower reaches of a river system have been allocated to an ICC footprint.

The RC may vary the actual number, distribution and level of an IMT from this schedule in order to manage local risks, as per section 15 of this JSOP.

IMTs should be in place as advised by the Regional Controller (RC) based on the risk, indicatively 2 hours before the community impact is expected to occur in the ICC footprint.

Where an IMT manages more than one ICC footprint, the RC in consultation with the SRC will determine the location of the IMT based on risk and consistent with the Regional Flood Response Plan and the SES Readiness and Activation considerations. Operational IMTs can be used for readiness, if they have the capacity to manage new emergencies in the initial stages

In addition to this schedule, the SRC may request a RC to form a Reserve IMT for deployment within a region or to support another region

In consultation with the SRC, a RC will advise when an IMT can deactivate or stand down the preparedness level.



Region	Primary ICC	ICC Cluster	Minor Mod Major	Flood Class Level (FCL) ⁴		
				Multiple > 2 0	Multiple >2 ≥1	Multiple Multiple ≥2
				Very High (high end)	Severe	Extreme
Loddon Mallee	Bendigo	Bendigo		Base (I)	Base (I)	Full (I)
	Mildura	Mildura		Base (C)	Base (I)	Core (I) Full (C)
		Swan Hill			Base (I)	Core (I) Full (C)
Grampians	Ballarat	Ballarat		Base (C)	Base (I)	Core (I) Full (C)
	Horsham	Horsham		Base (I)	Base (I)	Core (I) Full (C)
Barwon South West	Geelong	Geelong		Base (I)	Base (I) Core (C)	Core (I) Full (C)
	Warrnambool	Warrnambool		Base (C)	Base (I) Core (C)	Core (I) Full (C)
North West Metro	Sunshine	Sunshine		Base (I)	Core (I)	Core (I) Full (C)
		Burnley				Full (I)
Eastern Metro	Dandenong	Ferntree Gully		Base (I)	Core (I)	Core (I) Full (C)
Southern Metro		Dandenong				Full (I)
Hume	Benalla (NE CMA area)	Benalla		Base (I)	Base (I) Core (C)	Full (I)
		Wodonga				Base (I) Full (C)
		Wangaratta				Base (I) Core (C) Full (C)
	Seymour (Goulburn Broken - CMA area)	Seymour		Base (C)	Base (I) Core (C)	Core (I) Full (C)
		Shepparton				Full (C)
Gippsland	Traralgon	Traralgon		Base (C)	Base (I) Core (C)	Full (I)
	Bairnsdale	Bairnsdale				Base (I) Core (C)

⁴ Where no FCL provided for a river system, The RC is to consult the SES Agency Commander for the alignment of the warning issued to a FCL.

FLOOD READINESS AND ACTIVATION TRIGGER CONSIDERATIONS - V3.0 - SEPTEMBER 2017

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
FDI	0 - 11	12 - 24	25 - 34*	35 - 49*	50 - 74	75 - 99
Fire Behaviour	Fires can be easily controlled	Fires can be controlled, expect short distance spotting	Fires can be difficult to control, crown fires may develop in forest.	Fires can be difficult to control, crown fires may develop in forest.	Fires may be uncontrollable and move quickly. Spot fires may occur up to 4km ahead of the fire.	Fires will be uncontrollable, unpredictable and fast moving. Spot fires up to 6km ahead of the fire.
	Minor		Moderate		High End Moderate to Major	
Flood Prediction	Flood Watch issued and/or Minor Flood warning issued	Minor Flood Warning issued	Low to mid range Moderate Flood warning issued with low consequences for built environment based on risk	Moderate to high end MODERATE Flood Warning with moderate consequences for built environment based on risk Multiple other Rivers in MINOR	MAJOR Flood Warning predicted and/or >2 high end MODERATE Flood warnings with risks and consequences for built environment & economic	Two or more MAJOR Flood warning(s) or One with significant consequences / widespread evacuations for built environment, exceeding 1 in 100 year riverine event. Multiple MODERATE Flood Warnings. Large Dam failure considered very likely.
Flood Behaviour	Anticipated continued light rain. Catchments able to absorb predicted rain for consecutive days but may lead to flooding. Nil impacts or consequences predicted unless identified.	Anticipated continued rain. Catchments able to absorb predicted rain for consecutive days with minor flooding occurring. Low-lying areas next to water courses are inundated. Minor roads may be closed and low-level bridges submerged. In urban areas inundation may affect some backyards and buildings below the floor level as well as bicycle and pedestrian paths. In rural areas removal of stock and equipment may be required	Anticipated continued rain. Catchments likely to be saturated and unable to absorb continued rain. Areas of inundation are more substantial in size but consequence low. Main traffic routes may be affected. Unlikely for buildings to be affected above the floor level. Evacuation of flood affected areas may start to be considered. In rural areas removal of stock is required.	Anticipated continued rain. Catchments are saturated and unable to absorb continued rain. Areas of inundation are more substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood affected areas may be planned for. In rural areas removal of stock is required. Impact assessment may be required.	Anticipated continued high rain. Catchments are saturated and unable to absorb continued rain and runoff. Extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood affected areas likely. Utility services likely to be impacted.	Anticipated significant extreme weather event that will lead to rapidly rising river conditions. Catchments are saturated and unable to absorb current or additional runoff. Extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood affected areas are likely. Utility services will be impacted.
	VICSES - Business As Usual Operations			JSOP 2.03 LINE OF CONTROL		
Readiness Level (State)	Preparedness WHITE SDO and SAC (monitor)	Preparedness WHITE SDO and SAC (monitor)	Preparedness WHITE SDO and SAC (monitor)	SCC Level BLUE or When ICC activated SDO and SAC In Place	SCC Level ORANGE Multiple ICCs activated or multi region SDO and SAC In Place Consider Day/Night	SCC Level RED Multiple ICCs activated or multi region SDO and SAC In Place Day and Night
Readiness levels (Regional)	Preparedness WHITE RAC (Monitoring) RDO (monitor and issuing public information)	Preparedness WHITE RAC (Monitoring) RDO (monitor and issuing warnings)	Regional Command (on CALL/STBY) RAC (Monitoring) RDO (issuing warnings - oversighting basic response (eg: evac caravan park))	RURAL: Regional Cmd In Place, RC notified METRO - RCC OPEN: Base RCT in place RAC and RDO at the RCC FULL RCT on Standby REMT briefed by RAC	RCC OPEN: RCT in place, some agencies available on immediate recall RAC and RDO at the RCC REMT briefed by RAC and on standby to come in (as required)	RCC OPEN: Full RCT/most REMT In Place RAC and RDO at the RCC FULL RCT and REMT In Place
Readiness levels (Incident)			Base IMT (Rostered STBY)	Base IMT (In Place - Primary ICC)	RURAL - BASE IMT (In Place), CORE (On Call / Stand-by) METRO - CORE IMT (In Place) Observed activity - CORE IMT (In Place)	RURAL - CORE IMT (In Place), FULL (On Call / Stand-by) METRO - FULL IMT (In Place) Observed activity - FULL IMT (In Place)
People	Some minor inconvenience around local roads.		Increased number of roads being impacted traffic management plan should be considered.		Significant number of roads impacted traffic management plan is required some major roads closed with isolation or evacuation possible.	
Power	Possible power disruptions		Likely short term power disruptions		Power disruptions likely with some substations impacted and potential long term outages.	
Health	Little impact expected some local issues might be encountered but managed locally within own facility Plan		Consideration for review and familiarisation with facility Plan - VICPOL and DHHS to review Vulnerable persons list		Highly likely some hospitals isolated and vulnerable people isolation and require evacuation.	
Education	Unlikely impact		Some impact expected traffic management plan for school buses should be considered.		Some school and preschools may be inundated and school bus routes closures	
Road Network	Unlikely to impact		Some minor roads may be impacted with possible disruption to critical needs supplies such as milk		Highly likely for roads to be cut and egress and access impacted. Major roads potentially cut in some locations traffic diversions in place. Potential rescue of trapped persons in vehicles. Expected impact on rail routes. Economic impact likely with loss of commercial transport routes.	
Public Transport	Limited impact on public transport routes		Impact to public transport routes may occur but likely to be minimal with diversions possible		Public transport impacts will occur with roads and rail lines cut and no alternative route available - significant disruption to people movement likely	
Relief and Recovery	Relief and recovery activity unlikely may be some local issues.		Increased potential for relief and recovery activity but likely to be managed locally by LGA with support of DHHS		Formal arrangements put in place for relief and recovery activity Regional Recovery Commander appointed. Health Commander in Place and demands on relief and recovery to be substantial and potentially long term.	
Water utilities	Little impact expected some local issues might be encountered but managed locally.		Increased potential but still managed locally. May be minor sewerage overflow issues in isolated areas		Highly likely that some infrastructure will be impacted water authorities should develop or initiate their plans to address issues. Significant potential for pollutants including sewerage in water	
Telecommunications	Nil impact		Minimal impact to individual premises only		Significant impact with loss of landlines and mobile powers which will affect peoples capacity to receive warnings and information.	
Public Events	Maybe cancelled due to weather conditions only		Some public events may need to be cancelled or rescheduled due to safety of patrons either whilst at event or travelling to or from.		Public events impacted likely cancellation of major events due to flooding impact on venue or ability to attend or leave event.	
Tourism	Unlikely that event will be impacted but consideration must be given to any event occurring to ensure it is safe to continue.		Potential impact on tourist locations if area not safe to visit or isolated due to road closures.		May impact on high value tourist locations and facilities with long term impacts in the social and economic environment of communities.	
Agriculture/Animal welfare	No impact likely with landowners managing any localised issues.		Potential impact with losses to live stock, fencing and crops including high intensive farming of produce		Substantial impact to live stock, fencing (widespread), farm machinery and crops, including high intensive produce farming short and long term impacts due to loss of soil and erosion. Highly likely need for stock movement support and fodder resupply for isolated stock	
Remote communities	Inconvenience only		Some minor isolation of individual properties or remote communities is likely		Community isolation likely with resupply requirements as well as evacuation considerations needed	
Environmental	Minimal impact - some minor watercourse erosion		Stream erosion and loss of vegetation around watercourses		Significant disturbance to soil and vegetation	
Cultural Heritage	Minimal impact likely		Some disturbance along watercourses may occur but likely to be minimal		Potential for significant disturbance especially of flood of significance in area and flood of record	
Public Infrastructure /Essential Community Infrastructure	limited impact		Some disruption to access-Parks and low lying community areas and infrastructure - Some minor damage of community infrastructure build on floodplains		Significant damage to road infrastructure and community facilities. Long term closure of key community facilities likely	
Critical infrastructure	Nil impact		May require some preparatory work and discussion with owner of infrastructure		Significant work likely to be required to protect critical infrastructure - Contingency plans put in place if loss of the infrastructure occurs	

Regional Agency Commander (VICSES) provides advice to the Regional Controller re: forecast and consideration for varying the actual number, distribution and level of IMT required.

