Corangamite Shire

MUNICIPAL FLOOD EMERGENCY PLAN

A Sub-Plan of the Municipal Emergency Management Plan

For Corangamite Shire Council
and
VICSES Units Camperdown, Cobden, Lismore, Port Campbell and Terang

MFEP Version 3.0 October 2020

VICSES Template Version 6, January 2019

CORANGAMITE SHIRE

VICTORIA State Government

SES

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Distribution of the Municipal Flood Emergency Plan (MFEP)

Once endorsed and signed, the MFEP should be distributed to all MFEP committee members, MEMPC Chair, council, MERO, Deputy MERO, Representatives from; BoM, CMA, DELWP, Parks Victoria, Ambulance Victoria, Department of Transport, DHHS, relevant utilities, MERC, RERC, Police station, VICSES Units, VICSES Regional Office, CFA Brigades, CFA Regional office and Fire Rescue Victoria Stations (as applicable)

Document Transmittal Form / Amendment Certificate

This Municipal Flood Emergency Plan (MFEP) will be amended, maintained and distributed as required or every 3 years facilitated by VICSES in consultation with the Municipal Emergency Management Planning Committee (MEMPC)

Suggestions for amendments to this Plan should be forwarded to VICSES Regional Office – Geelong via swem@ses.vic.gov.au

Amendments listed below have been included in this Plan and updated as a new version.

Amendment Number	Date of Amendment	Amendment Entered By	Summary of Amendment
2.3	August 2014	Arno van der Schans	Details of Nos1 & 2 Irrigation Dams at 463 Moreys Road, Brucknell included
2.4	August 2014	Arno van der Schans	Details for Evans Dam, 357 Batemans Road, Camperdown included
2.5	September 2014	Arno van der Schans	Details for Molloy's Dam, 869 Cobden-Terang Road, Cobrico included
V3.0	September 2020	Ken Smith, Ian Carlton & Clare Mintern	Transferred into new VICSES template, updated flood information.

This Plan will be maintained on the VICSES website at www.ses.vic.gov.au/get-ready/your-local-flood-information and Municipality website (if required).

List of Abbreviations & Acronyms

The following abbreviations and acronyms are used in the Plan			
AAR	After Action Review	**IMT**	Incident Management Team
AEP	Annual Exceedance Probability	**JSOP**	Joint Standard Operating Procedure
AHD	Australian Height Datum (the height of a location above mean sea level in metres)	**LSIO**	Land Subject to Inundation Overlay
AIDR	Australian Institute of Disaster Resilience	**MEMP**	Municipal Emergency Management Plan
AIIMS	Australasian Inter-service Incident Management System	**MEMPC**	Municipal Emergency Management Planning Committee
AoOCC	Area of Operations Control Centre / Command Centre	**MERC**	Municipal Emergency Response Coordinator
ARI	Average Recurrence Interval	**MERO**	Municipal Emergency Resource Officer
ARMCANZ	Agricultural & Resource Management Council of Australia & New Zealand	**MFB**	Metropolitan Fire Brigade
AV	Ambulance Victoria	**MFEP**	Municipal Flood Emergency Plan
BoM	Bureau of Meteorology	**MFPC**	Municipal Flood Planning Committee
CEO	Chief Executive Officer	**MRM**	Municipal Recovery Manager
CERA	Community Emergency Risk Assessment	**PMF**	Probable Maximum Flood
CFA	Country Fire Authority	**RAC**	Regional Agency Commander
CMA	Catchment Management Authority	**RCC**	Regional Control Centre
DELWP	Department of Environment, Land, Water and Planning	**RDO**	Regional Duty Officer
DJPR	Department of Jobs, Precincts and Regions	**RERC**	Regional Emergency Response Coordinator
DHHS	Department of Health and Human Services	**RERP**	Region Emergency Response Plan
EMLO	Emergency Management Liaison Officer	**SAC**	State Agency Commander
EMV	Emergency Management Victoria	**SBO**	Special Building Overlay
EMMV	Emergency Management Manual Victoria	**SCC**	State Control Centre
EMT	Emergency Management Team	**SDO**	State Duty Officer
ERC	Emergency Relief Centre	**SERP**	State Emergency Response Plan
EO	Executive Officer	**SEWS**	Standard Emergency Warning Signal
FO	Floodway Overlay	**SOP**	Standard Operating Procedures
IIA	Initial Impact Assessment	**VICPOL**	Victoria Police
IEMT	Incident Emergency Management Team	**VICSES**	Victoria State Emergency Service
IMS	Incident Management System		

Part 1. Introduction

1.1 Approval and Endorsement

This Municipal Flood Emergency Plan (MFEP) has been prepared by Corangamite Shire Council Municipal Flood Planning Committee and with the authority of the Corangamite Shire Council MEMP Committee pursuant to Section 20 of the Emergency Management Act 1986 (as amended).

This MFEP is a sub plan to the Corangamite Shire Council Emergency Management Plan (MEMP), is consistent with the Emergency Management Manual Victoria (EMMV) and the Victorian Floodplain Management Strategy (2016), and takes into account the outcomes of the Community Emergency Risk Assessment (CERA) process undertaken by the Municipal Emergency Management Planning Committee (MEMPC).

The MFEP is consistent with the Region Emergency Response Plan – Flood Sub Plan and the State Emergency Response Plan – Flood sub-plan.

This MFEP is a result of the cooperative efforts of the MFPC and its member agencies.

This Plan is approved by the VICSES Regional Manager.

This Plan is endorsed by the Corangamite Shire Council MEMPC as a sub-plan to the MEMP.

Approval

Stephen Warren Date 29/10/2020

South West Region VICSES Regional Manager

Endorsement

Cr. Jo Beard Date

Chair – Municipal Emergency Management Planning Committee

1.2 Purpose and Scope of this Flood Emergency Plan

The purpose of this MFEP is to detail arrangements agreed for managing a flood emergency before, during and after it occurs or potentially occurs within Corangamite Shire Council

As such, the scope of the Plan is to:

- Identify the local flood risk;
- Support the implementation of mitigation and planning measures to minimise the causes and impacts of flooding;
- Detail emergency management arrangements;
- Identify linkages with Local, Regional and State emergency and wider planning arrangements with a specific emphasis on those relevant to flood.

1.3 Municipal Flood Planning Committee (MFPC)

Membership of the Corangamite Shire Council Municipal Flood Planning Committee (MFPC) comprises of the following representatives from the following agencies and organisations:

- VICSES (i.e. Unit Controller & Regional Officer – Emergency Management) **(Chair)**,
- Council (i.e. Municipal Emergency Resource Officer)
- Victoria Police (i.e. Municipal Emergency Response Co-ordinator) (MERC),
- Catchment Management Authority (CMA),
- Department of Transport
- Department of Health and Human Services (DHHS) as required,
- Department of Environment, Land, Water and Planning (DELWP) as required,
- Water Authorities as required,
- Bureau of Meteorology as required,
- Local community representatives as required

1.4 Responsibility for Planning, Review & Maintenance of this Plan

This MFEP must be maintained in order to remain effective.

VICSES through the MFPC has responsibility for facilitating the preparation, review, maintenance and distribution of this plan.

The MFPC will meet at least once per year. The plan should be reviewed following:

- A new flood study;
- A significant change in flood mitigation measures;
- After the occurrence of a significant flood event within the Municipality;
- Or if none of the above occur, every 3 years.

Part 2. BEFORE: Prevention / preparedness arrangements

1.5 Community Engagement and Awareness

Details of this MFEP will be released to the community through; local media, FloodSafe engagement initiatives and websites (VICSES and the Municipality) upon formal adoption by VICSES and the Municipality

VICSES with the support of Corangamite Shire Council and Corangamite Catchment Management Authority will coordinate targeted community flood engagement programs within the council area.

Refer to appendix H (LFG and FloodSafe Information. Attach any broader FloodSafe details).

1.6 Structural Flood Mitigation Measures

There are no flood protection levees in the Corangamite Shire.

During 2015-2016 Corangamite Shire undertook flood mitigation works in Skipton. These works consisted of the installation of larger capacity overflow infrastructure to prevent the more frequent flood events impacting business and residents in the main street. 1200mm x 600mm box culverts were installed to carry overflow water from the Skipton dam away from the town centre to reduce the risk of flooding from the rain events experienced by the township of Skipton.

These works are not designed to address flood levels caused by Mount Emu Creek flooding but will effectively reduce more frequent flood events between 10% and 5% AEP.

1.7 Non-structural Flood Mitigation Measures

1.7.1 Exercising the Plan

Arrangements for exercising this Plan will be at the discretion of the MEMPC. It is recommended that the MFEP is exercised on an annual basis and reviewed in line with Section 1.4.

1.7.2 Flood Warning

Arrangements for Bureau issued Flood Watch and Flood Warning products are contained within the State Emergency Response Plan (SERP) Sub Plan – Flood (www.ses.vic.gov.au/em-sector/vicses-emergency-plans) and on the Bureau of Meteorology (BoM) website www.bom.gov.au.

Details on Warnings issued by VICSES through VicEmergency and VICSES channels are outlined in **Appendix E**.

1.7.3 Local Knowledge

Community Observers provide local knowledge to VICSES and the Incident Control Centre regarding local insights and the potential impacts and consequences of an incident and may assist with the dissemination of information to community members.

Specific details of arrangements to capture local knowledge are provided in **Appendix G**.

Part 3. DURING: Response arrangements

3.1 Introduction

3.1.1 Activation of Response

Flood response arrangements may be activated by the Regional Duty Officer (RDO) or the Regional Agency Commander (RAC) VICSES South West Region.

The VICSES Incident Controller (IC) / RDO will activate agencies as required as documented in the State Emergency Response Plan Sub Plan - Flood.

3.1.2 Responsibilities

There are a number of agencies with specific roles that will act in support of VICSES and provide support to the community in the event of a serious flood within the Corangamite Shire Council. These agencies will be engaged through the Emergency Management Team (EMT).

The general roles and responsibilities of supporting agencies are as agreed within the: MEMP, EMMV (Part 7 'Emergency Management Agency Roles') and SERP Sub Plan - Flood and Regional Emergency Response Plan - Flood.

3.1.3 Emergency Coordination Centre or equivalent

If established, liaison with the emergency coordination centre will be through the established Division / Sector Command and through Municipal involvement in the IEMT, in particular the Municipal Emergency Response Coordinator (MERC). The VICSES RDO / IC will liaise with the centre directly if no Division / Sector Command are established.

The function, location, establishment and operation of an emergency coordination centre if relevant will be as detailed in the MEMP.

3.1.4 Escalation

Many flood incidents are of local concern and an appropriate response can usually be coordinated using local resources. However, when these resources are exhausted, the State's arrangements provide for further resources to be made available, firstly from neighbouring Municipalities (on a regional basis) and then on a State-wide basis.

Resourcing and event escalation arrangements are described in Part 3 of the EMMV.

3.2 The six C's

Arrangements in this MFEP must be consistent with the 6 C's detailed in State and Regional Flood Emergency Plans and the MEMP. For further information, refer to Part 3 of the EMMV.

- **Command:** Overall direction of response activity in an emergency.
- **Control:** Internal direction of personnel and resources within an agency.
- **Coordination:** Bringing together agencies and resources to ensure effective preparation for response and recovery.
- **Consequence:** Management of the effect of emergencies on individuals, communities, infrastructure and the environment.
- **Communication:** Engagement and provision of information across agencies and proactively with the community around preparation, response and recovery in emergencies.
- **Community Connection:** Understanding and connecting with trusted networks, leaders and communities around resilience and decision making.

Specific details of arrangements for this plan are to be provided in **Appendix C**.

3.2.1 Control

Functions 5(a) and 5(c) at Part 2 of *the Victoria State Emergency Service Act 1986 (as amended)* detail the authority for VICSES to plan for and respond to flood.

Part 7 of the EMMV prepared under the *Emergency Management Act 1986 (as amended)*, identifies VICSES as the Control Agency for flood. It identifies Department of Environment, Land, Water and Planning (DELWP) as the Control Agency responsible for "dam safety, water and sewerage asset related incidents" and other emergencies. A more detailed explanation of roles and responsibilities is provided in later sections of Part 7 of the EMMV.

All flood response activities within the Corangamite Shire Council including those arising from a dam failure or retarding basin / levee bank failure incident will therefore be under the control of the appointed IC, or delegated representative.

3.2.2 Incident Controller (IC)

An Incident Controller (IC) will be appointed by the VICSES (as the Control Agency) to command and control available resources in response to a flood event on the advice of the Bureau of Meteorology (or other reliable source) that a flood event will occur or is occurring. The IC responsibilities are as defined in Part 3 of the EMMV.

3.2.3 Incident Control Centre (ICC)

As required, the IC will establish an Incident Control Centre (ICC) from which to initiate incident response command and control functions. The decision as to if and when the ICC should be activated, rests with VICSES as the Control Agency.

Pre-determined ICC locations are available in (JSOP 02.03 Schedule 4), the following ICC has been identified for use for incidents within Corangamite Shire.

Incident Level	Location	ICC Location	Facility owner	Key contact
2 & 3	Corangamite	Warrnambool	CFA	District 5 OM

3.2.4 Divisions and Sectors

To ensure that effective Command and Control arrangements are in place, the IC may establish Divisions and sectors depending upon the complexity of the event and resource capacities.

The following Divisions and Sectors may be established to where applicable to assist with the management of flooding within the Municipality:

Division	Sector
Warrnambool	Camperdown
	Cobden
	Lismore
	Port Campbell
	Terang

3.2.5 Incident Management Team (IMT)

The IC will form an Incident Management Team (IMT).

Refer to Part 3 of the EMMV for guidance on IMTs and Incident Management Systems (IMSs) or refer to the EMV Victorian Emergency Operations Handbook at https://www.emv.vic.gov.au/publications/victorian-emergency-operations-handbook.

3.2.6 Incident Emergency Management Team (IEMT)

The IC will establish a multi-agency Incident Emergency Management Team (IEMT) to assist the flood response. The IEMT consists of key personnel (with appropriate authority) from stakeholder agencies and relevant organisations who need to be informed of strategic issues related to incident control. They are able to provide high level strategic guidance and policy advice to the IC for consideration in developing incident management strategies.

Organisations, including Corangamite Shire Council, required within the IEMT will provide an Emergency Management Liaison Officer (EMLO) to the ICC if and as required as well as other staff and / or resources identified as being necessary, within the capacity of the organisation.

Refer to 3 of the EMMV for guidance on IEMTs.

3.2.7 On Receipt of a Flood Watch / Severe Weather Warning

VICSES internal SOP's - SOP008 and VICSES SOP009 outline in detail the actions to be undertaken upon receipt of a Flood Watch / Flood Warning or Severe Weather Warning. The VICSES RDO will undertake actions as defined within the flood intelligence cards **(Appendix C)** until an IC is appointed and assumes control of the incident. General considerations by the IC / VICSES RDO may include (but are not limited to):

- Review flood intelligence to assess likely flood consequences
- Monitor weather and flood information – www.bom.gov.au
- Assess Command and Control requirements.
- Review local resources and consider needs for further resources regarding personnel, property protection, flood rescue and air support
- Notify and brief appropriate officers. This includes Regional Control Centre (RCC) (if established), State Control Centre (SCC) (if established), Council, other emergency services through the IEMT.
- Assess ICC readiness (including staffing of IMT and IEMT) and open if required
- Ensure flood warnings and community information is prepared and issued to the community where required
  - Flood (Riverine and flash) Warnings are managed by the RDO / RAC
  - Severe Weather / Thunderstorm warnings are managed by SDO / SAC
- Develop media and public information management strategy
- Monitor watercourses and undertake reconnaissance of low-lying areas
- Ensure flood mitigation works are being checked by owners
- Develop and issue incident action plan, if required
- Develop and issue situation report, if required

3.2.8 On Receipt of the First and Subsequent Flood Warnings

The VICSES RDO will undertake actions as defined within the flood intelligence cards (Appendix C) until an IC is appointed. General considerations by the VICSES RDO / IC may include (but are not limited to):

- Develop an appreciation of current flood levels and predicted levels. Are floodwaters rising, steady, peaking or falling?
- Review flood intelligence to assess likely flood consequences.
- Consider:

- What areas may be at risk of inundation?
- What areas may be at risk of isolation?
- What areas may be at risk of indirect affects as a consequence of power, gas, water, telephone, sewerage, health, transport or emergency service infrastructure interruption?
- The characteristics of the populations at risk

- Determine what the at-risk community need to know and do as the flood develops.
- Warn the at-risk community including ensuring that an appropriate warning and community information strategy is implemented including details of:

- The current flood situation
- Flood predictions
- What the consequences of predicted levels may be
- Public safety advice
- Who to contact for further information
- Who to contact for emergency assistance

- Liaise with relevant asset owners as appropriate (eg. Water, power utilities)
- Implement response strategies as required based upon flood consequence assessment.
- Continue to monitor the flood situation – www.bom.gov.au/vic/flood/
- Continue to conduct reconnaissance of low-lying areas
- Liaise with relevant flood mitigation infrastructure managers

3.3 Initial Impact Assessment

Initial impact assessments will be conducted in accordance with Part 3 section 5.2.5 of the EMMV to assess and record the extent and nature of damage caused by flooding. This information may then be used to provide the basis for further needs assessment and recovery planning by DHHS and recovery agencies.

3.4 Preliminary Deployments

When flooding is expected to be severe enough to cut access to towns, suburbs and / or communities the IC will consult with relevant agencies to ensure that resources are in place if required to provide emergency response and emergency relief services if required. These resources might include emergency service personnel, food items and non-food items such as medical supplies, shelter, assembly areas, relief centres etc.

3.5 Response to Flash Flooding

Emergency management response to flash flooding should be consistent with the guideline for the emergency management of flash flooding contained within the State Emergency Response Plan – Flood Sub Plan.

When conducting pre-event planning for flash floods the following steps should be followed, and in the order as given:

1. Determine if there are barriers to evacuation by considering warning time, safe routes, resources available and etc;

2. If evacuation is possible, then evacuation should be the adopted strategy and it must be supported by a public information capability and a rescue contingency plan; (If time permits, any planning or discussion around evacuation should be made in consultation with VICPOL, IEMT and other expert advice where available)

3. Where it is likely people will become trapped by floodwaters due to limited evacuation time or options safety advice needs to be provided to people at risk. Advice should be given to not attempt to flee by entering floodwater. If people become trapped, it may be safer to seek the highest point within the building and to telephone 000 if they require rescue.

4. For buildings known to be structurally un-suitable an earlier evacuation trigger will need to be established (return to step 1 of this cycle).

5. If an earlier evacuation is not possible then specific preparations must be made to rescue occupants trapped in structurally unsuitable buildings either pre-emptively or as those people call for help.

6. Contact the Corangamite MERC and MERO at the earliest opportunity to allow for relief preparation to commence.

Due to the rapid development of flash flooding it will often be difficult, to establish relief centres ahead of actually triggering the evacuation. This is normal practice but this is insufficient justification for not adopting evacuation.

Refer to **Appendix C** for response arrangements for flash flood events.

3.6 Evacuation for all flooding

The IC decides whether to warn people to evacuate or if it is recommended to evacuate immediately.

Once the decision is made VICPOL are responsible for the management of the evacuation process where possible. VICSES and other agencies will assist where practical. VICSES is responsible for the development and communication of evacuation warnings.

VICPOL and / or Australian Red Cross may take on the responsibility of registering people affected by a flood emergency including those who have been evacuated.

Refer to EMMV Part 8, Appendix 9 and the Evacuation Guidelines and JSOP 03.12 for guidance of evacuations for flood emergencies.

Refer to **Appendix C** of this Plan and the MEMP for additional local evacuation considerations for the municipality.

3.7 Flood Rescue

VICSES may conduct flood rescues on behalf of the VICPOL who are the Control Agency. Appropriately trained and equipped VICSES units or other agencies that have appropriate training, equipment and support may carry out rescues.

Rescue operations may be undertaken where voluntary evacuation is not possible, has failed or is considered too dangerous for an at-risk person or community. An assessment of available flood rescue resources (if not already done prior to the event) should be undertaken prior to the commencement of Rescue operations.

Rescue is considered a high-risk strategy to both rescuers and persons requiring rescue and should not be regarded as a preferred emergency management strategy. Rescuers should always undertake a dynamic risk assessment before attempting to undertake a flood rescue.

Victoria Police Rescue Coordination Centre should be notified of any rescues that occur: (03) 9399 7500

The following resources are available within Corangamite Shire to assist with rescue operations:

- Rescue Boat – Camperdown SES Unit
- Geelong, South Barwon and Warrnambool Units have a land based swift water rescue teams

Known high-risk areas / communities (i.e. low-lying islands) where rescues might be required include:

- Skipton

3.8 Aircraft Management

Aircraft can be used for a variety of purposes during flood operations including evacuation, resupply, reconnaissance, intelligence gathering and emergency travel.

Air support operations will be conducted under the control of the IC

The IC may request aircraft support through the State Air Desk located at the SCC will establish priorities.

Suitable airbase facilities are located at:

- Warrnambool and Ballarat Airports (24 hrs lighting)

The following Helicopter Landing Zones are available for use. In addition, there are numerous areas that could be used for helicopter landings, such as community ovals, roads etc.

- Skipton Oval
- Cobden Airfield

3.9 Resupply

Communities, neighbourhoods or households can become isolated during floods as a consequence of road closures or damage to roads, bridges and causeways. Under such circumstances, the need may arise to resupply isolated communities / properties with essential items.

When predictions / intelligence indicates that communities, neighbourhoods and / or households may become isolated, VICSES will advise businesses and / or households that they should stock up on essential items.

After the impact, VICSES can support isolated communities through assisting with the transport of essential items to isolated communities and assisting with logistics functions.

Resupply operations are to be included as part of the emergency relief arrangements with VICSES working with the relief agencies to service communities that are isolated.

3.10 Essential Community Infrastructure and Property Protection

Essential Community Infrastructure and Property (e.g. residences, businesses, roads, power supply etc.) may be affected in the event of a flood.

The IC will determine the priorities related the use of sandbags, which will be consistent with the strategic priorities.

If VICSES sandbags are becoming limited in supply, then priority will be given to protection of Essential Community Infrastructure. Other high priorities may include for example the protection of historical buildings.

Property may be protected by:

- Sandbagging to minimise entry of water into buildings
- Encouraging businesses and households to lift or move contents
- Construction of temporary levees in consultation with the CMA, Local Government Authorities (LGA) and VICPOL and within appropriate approval frameworks.

The IC will ensure that owners of Essential Community Infrastructure are kept advised of the flood situation. Essential Community Infrastructure providers must keep the IC informed of their status and ongoing ability to provide services.

Contact your local VICSES representative for the most current Sandbag Guidelines or download it from IMT Toolbox in EMCOP - Operations.

Refer to **Appendix C** for further specific details of essential infrastructure requiring protection and location of sandbag collection point(s).

3.11 Disruption to Services

Disruption to services other than essential community infrastructure and property can occur in flood events. Refer to **Appendix C** for specific details of likely disruption to services and proposed arrangements to respond to service disruptions in Corangamite Shire Council.

3.12 Road Closures

Corangamite Shire Council and the Department of Transport will carry out their formal functions of road closures including observation and placement of warning signs, road blocks etc. to its designated local and regional roads, bridges, walking and bike trails if required. Corangamite Shire Council staff should also liaise with and advise the Department of Transport as to the need or advisability of erecting warning signs and / or of closing roads and bridges under its jurisdiction. Department of Transport are responsible for designated main roads and highways and councils are responsible for the designated local and regional road network.

Corangamite Shire Council and the Department of Transport will communicate community information regarding road closures. Information will be updated on the VIC Traffic website: https://traffic.vicroads.vic.gov.au/

Refer to **Appendix C** for specific details of potential road closures.

3.13 Dam Spilling / Failure

DELWP is the Control Agency for dam safety incidents (e.g. breach, failure or potential breach / failure of a dam), however VICSES is the Control Agency for any flooding that may result.

DELWP have developed Dam Safety Emergency Plans for municipalities where it is applicable.

Major dams with potential to cause structural and community damage within the Municipality are described in **Appendix A**.

3.14 Waste Water related Public Health Issues and Critical Sewerage Assets

Inundation of critical sewerage assets including septic tanks and sewerage pump stations may result in water quality problems within the Municipality. Where this is likely to occur or has occurred the responsibility agency for the critical sewerage asset should undertake the following:

- Advise VICSES of the security of critical sewerage assets to assist preparedness and response activities in the event of flood;
- Maintain or improve the security of critical sewerage assets;
- Check and correct where possible the operation of critical sewerage assets in times of flood;
- Advise the ICC in the event of inundation of critical sewerage assets.

It is the responsibility of the Corangamite Shire Council Environmental Health Officer to inspect and report to the MERO and the ICC on any water quality issues relating to flooding.

3.15 Access to Technical Specialists

VICSES manages contracts with private technical specialists who can provide technical assistance in the event of flood operations or geotechnical expertise. Refer to VICSES SOP061 for the procedure to engage these specialists.

3.16 Transition from Response to Recovery

VICSES as the Control Agency is responsible for ensuring effective transition from response to recovery. This transition will be conducted in accordance with existing arrangements as detailed in Part 3 of the EMMV or Corangamite Shire Council MEMP.

If agreement is reached at that meeting to terminate response activities, the IC in consultation with the MERC will advise all agencies of the time at which response terminates and arrangements will be made to maintain Municipal emergency coordination functionality for an agreed period.

3.17 After Action Review

VICSES will coordinate the after action review arrangements of flood operations as soon as practical following an event.

All agencies involved in the flood incident should be represented at the after action review.

Part 4. AFTER: Emergency Relief and Recovery Arrangements

4.1 General

Arrangements for emergency relief and recovery from a flood and / or storm event within the Corangamite Shire Council are detailed in the Corangamite Shire Council MEMP and / or the Otway District Relief and Recovery Plan.

4.2 Emergency Relief

The decision to recommend the opening of an emergency relief centre sits with the IC. The IC is responsible for ensuring that relief arrangements have been considered and implemented where required under the State Emergency Relief and Recovery Plan (Part 4 of the EMMV).

The range and type of emergency relief services to be provided in response to a flood event will be dependent upon the size, impact, and scale of the flood or storm. Refer to Part 4 of the EMMV for details of the range of emergency relief services that may be provided.

Details of the relief arrangements are available in the MEMP.

4.3 Animal Welfare

Matters relating to the welfare of livestock and companion animals (including feeding and rescue) are to be referred to Department of Jobs, Precincts and Regions (DJPR Agriculture Victoria).

Requests for emergency supply and / or delivery of fodder to stranded livestock or for livestock rescue are to be passed to DJPR (Agriculture Victoria).

- Matters relating to the welfare of wildlife are to be referred to DELWP
- See also Corangamite Shire Emergency Animal Welfare Plan

Appendix A: Flood threats for Corangamite Shire

This Appendix provides a broad overview of flood risk within the Municipality. Detailed Flood Risk Information for individual communities should be detailed in **Appendix C.**

Coastal, Stormwater and Riverine Flooding

Within the Corangamite Shire Council is impacted by riverine, coastal and stormwater flooding.

Along the coast, two estuaries that are subject to coastal flooding include the Gellibrand River Estuary and the Port Campbell Creek Estuary. Although the Curdies River Estuary is located within the Moyne Shire, flooding from this Estuary causes flooding on adjacent farmland within the Corangamite Shire.

Towns that are impacted by stormwater flooding include Skipton, Camperdown, Terang and Port Campbell.

The Corangamite Shire has a long history of riverine flood events. Towns impacted by riverine flooding include Skipton and Port Campbell. The most significant recent flood event was recorded in January 2011, refer to table 1 of significant flood events below.

Table 1. Historic flood events.

Year	Description
September 2016	Minor flooding in Skipton and the lower Curdies River. The highest daily rainfalls were recorded on the 14th, Skipton, 31.2 mm.
January 2011	Extreme rainfall was observed during January, Mt Emu Creek and Burrumbeet Creek catchments recorded between 200mm and 300mm of rainfall for the month. 64.4mm of rainfall was recorded on the 14th at Skipton. In Skipton, shops on the lower end of Montgomery Street (the main commercial centre) including the supermarket, chemist, hotel, garage, art gallery and pottery were flooded along with 30 residential properties. Flood depths exceeded 1.5m in some properties. The Glenelg Highway Bridge was overtopped and the Highway was closed for more than 2 days. The town was split in two. This was the largest flood on record at Skipton. An aerial image of inundation in Skipton at the Glenelg Highway.
February 2011	Follow-on rain in the Mt Emu Creek catchment on top of a very wet catchment resulted in a relatively small flood through Skipton on the 5th and 6th of February.
August 2010	Conditions prior to August 2010 were relatively dry. Very heavy rainfall was recorded between the 10th to 12th of August within the Mt. Emu Creek Catchment. The highest daily falls were recorded on the 12th in Skipton. Flooding in Mt Emu Creek caused relatively minor flooding in Skipton approx 1 in 5 to 10-year AEP during the11th to 14th August. The flood peak was just above the top of bank through the town and at Stewart Park. No roads or buildings were inundated. Both the Gellibrand River and the Curdies River experienced significant flows. Flow in the Curdies River was the highest on record. Significant flows were recorded in the Gellibrand River. The largest recent flood in the Curdies River.
September 2010	Heavy rain was recorded in the Mt Emu Creek and Burrumbeet Creek catchments from late Friday 3rd into Saturday 4th. The highest rainfall recorded on the 4th at the Ballarat Aerodrome 46mm and Beaufort 29.2mm. 10mm of rainfall was at recorded at Skipton on the 13th. Flooding in Skipton was more severe than in August 2010. The tributary of Mt Emu Creek flowing through Jubilee Park Lake flooded Anderson Street and Montgomery Street and flooded a number of properties. Over-bank flooding from Mt Emu Creek flooded a number of properties and dwellings. Backflow through a stormwater drain into the centre of Skipton along Montgomery Street also flooded a number of business and cut access to the Glenelg Highway (Montgomery Street). This flood has been estimated to be between a 1 in 10 and 20 year AEP event.
1983	Minor flooding in the Mt Emu Creek at Skipton.
1975	A significant flood event in the Curdies River. Minor flooding in the Mt Emu Creek at Skipton.
July 1923	A significant flood event in the Mt Emu Creek caused significant damage to buildings and infrastructure in Skipton.

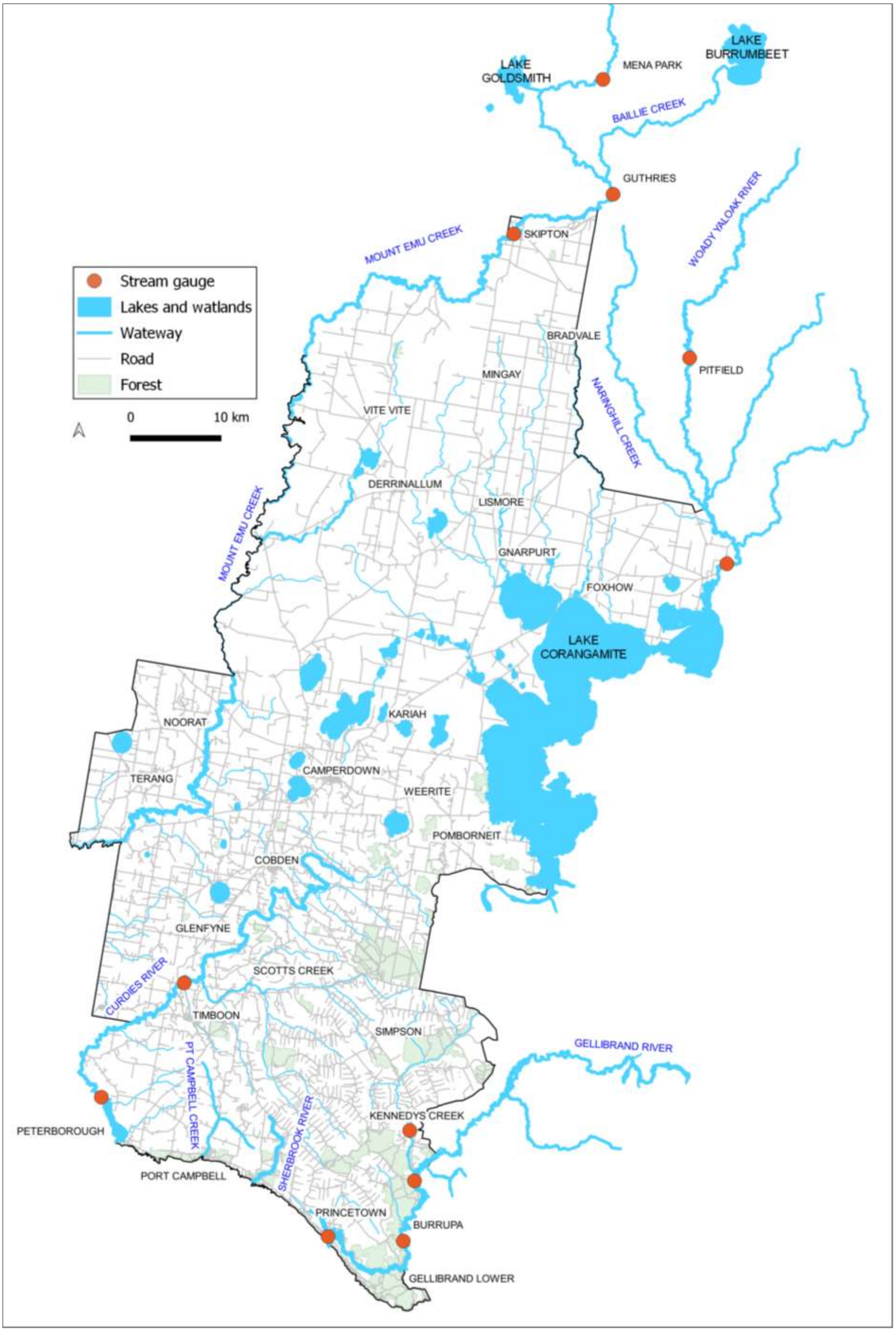

Figure 1. Corangamite Shire waterways.

Description of Major Waterways and Drains

Waterway or Drain	Description
Mt. Emu Creek	The upper reaches of the Mt. Emu Creek begins as a small waterway south of Lexton and flows through Langi Kal Kal, Trawalla, and Skipton. The catchment area of Mt. Emu Creek is approximately 3,150 km^2. Mt. Emu Creek receives inflows from Baillie Creek and other minor waterways upstream of Skipton. The Baillie Creek catchment begins at Lake Burrumbeet and flows west where is joins Mt. Emu Creek 1.5 km north of the Guthries stream gauge. There are three stream gauges along the Mt. Emu Creek that provide flood warning for Skipton, these include Mena Park, Guthries and Skipton. Two temporary stream PALs gauges can also be installed by DELWP (as needed) at Baillie Creek and along Mt. Emu Creek at Cameron Bridge. Rises in streamflow at Skipton can occur between 8 to 20 hours after rainfall in the upper catchment.
Baillie Creek	The Baillie Creek catchment begins at Lake Burrumbeet and flows west where is joins Mt. Emu Creek 1.5 km north of the Guthries stream gauge. The total catchment area is around 160 km^2. During historic flood events spills from Lake Burrumbeet has also contributed significant flood flows to Skipton. Hydrologic modelling (Water Technology 2020) indicates that during the January 2011 flood event Baillie Creek contributed up to 37.5% of the peak flood flow in Skipton. Flooding from Lake Burrumbeet spills can take between 8 to 15.5 hours to arrive in Skipton.
Woady Yaloak River and Diversion Channel	The upper reach of Woady Yaloak River begins in Alfredton, the southern fringe of Ballarat. Woady Yaloak River then flows south through Smythesdale, Pitfield, Cressy and flows south into Lake Corangamite through Lake Martin. The floodplain between Cressy and Lake Martin is small and well defined. When Lake Martin is at full supply level, water backs up along the river, flooding adjoining farmland and causing some inconvenience. Woady Yaloak River can be diverted into Warrambine Creek via the Woady Yaloak Diversion Channel north of the Cundare Pool (north of Lake Corangamite). The Woady Yaloak Diversion Channel has a capacity of around 490 ML/d. Flows harvested from Woady Yaloak River allows diversion of floodwaters from Lake Corangamite to the Barwon River. This drainage scheme was built following the 1950's floods to protect agricultural land from flooding around Lake Corangamite.
Lake Corangamite	Lake Corangamite is listed as a Ramsar wetland that provides habitat for local and international rare and threatened flora and fauna. It is the largest permanent salt-water Lake in Australia. It is 234 km^2 in size. Given the capacity of Lake Corangamite is 407,000 ML and the annual inflow from the Woady Yaloak River and Pirron Yallock Creek can be up to 60,000 ML/d, it takes several years of above average inflows to fill the Lake. Due to the flatness of the landscape, small lakes and wetlands surrounding Lake Corangamite fill and spill into adjacent depressions, generally towards Lake Corangamite creating wide flow paths. These surrounding lakes include Lake Martin, Cundare Pool, Lake Bookar, Lake Colongulac, Lake Cundare, Lake Gnarput, Lake Weering, Lake Terangpom and Lake Milangil. During prolonged wet periods, when Lake Corangamite floods it also spills into adjacent lakes, joining with surrounding lakes. These lakes are a mixture of fresh and saline systems. Lake Corangamite has no natural outlets. Water is mainly lost by evaporation or seepage.
Gellibrand River	The Gellibrand River originates outside the Corangamite Shire in the Otway Ranges near Upper Gellibrand. The Gellibrand River enters the Corangamite Shire at Lower Gellibrand and discharges to the Southern Ocean at Princetown. It has many tributary creeks, mainly within the Colac Otway Shire. Within Corangamite Shire, Kennedys Creek is its main tributary. The floodplains of the Gellibrand River and its tributaries are well developed and have a relatively flat gradient. Floodwaters are therefore generally well confined by the narrow floodplain and are fast flowing with significant depths.

Curdies River	The Curdies River originates near Lake Purrumbete, 10km west of Lake Corangamite. The catchment area of Curdies River is approximately 8.3km^2. A drain skirting the edge of a lava flow originating from Mount Porndon connects Lake Purrumbete to the upper reach of the Curdies River. The Curdies River flows in a southerly direction through Curdies and enters the Southern Ocean at Peterborough. The Curdies River received inflows from Scotts Creek north of Timboon. Scotts Creek drains steep terrain surrounding Simpson. This is a high rainfall area, contributes significant flows to the Curdies River during flood events. Flooding in the lower Curdies River is heavily influenced by costal processes at the Curdies River Estuary. The influence of these factors on flooding varies with the condition of the Estuary entrance, tides, swell, storm surges, the height of the sandbar and river flow. If flooding occurs in the Curdies River when the Estuary mouth is closed, this will significantly increase flood levels on adjacent farmland.

Building Damages

Refer to the table below for property and building damages for flood events within the Corangamite Shire Council. The table also provides an indication of when a Level 2 and 3 Incident Control Centre (ICC) will be required, based on the number of above floor damages.

Table 2. Corangamite Shire Council building damages.

Annual Exceedance Probability (1 in year)	Total number of properties flooded (buildings flooded above floor)				Total damages for the Corangamite Shire Council
	Skipton (Appendix C1)	Camperdown* (Appendix C2)	Terang* (Appendix C3)	Pt. Campbell* (Appendix C4)	
5	1 (0)	0 (0)	0 (0)	0 (0)	1 (0)
10	3 (2)	0 (0)	0 (0)	0 (0)	3 (2)
20	32 (19)	0 (0)	0 (0)	0 (0)	32 (19)
50	34 (24)	0 (0)	0 (0)	0 (0)	34 (24)
100	37 (26)	20 (12)	10 (2)	10 (1)	77 (41)
200	37 (28)	25 (13)	15 (3)	15 (3)	92 (47)
500	39 (28)	30 (14)	20 (4)	20 (4)	109 (50)

*Estimated damages using anecdotal flood information provided by the VICSES Terang and Camperdown Units and the Corangamite Shire Council.

Level 2 ICC

Level 3 ICC

Dam Spilling / Failure

Significant dams or lakes that influence flooding within the Corangamite Shire Council area are listed below.

Table 3. Dams and lakes that influence flooding.

Dam/Lake	Owner	Full Supply Volume	Comments
Lake Burrumbeet	DELWP	38,000 ML	During the January 2011 flood event, Lake Burrumbeet contributed significant flow to Mt. Emu Creek via Baillie Creek, increasing flood impacts in Skipton. Hydrologic modelling (Water Technology 2020) indicates that during the January 2011 flood event Baillie Creek contributed up to 37.5% of the peak flood flow in Skipton. Flooding from Lake Burrumbeet spills can take between 8 to 15.5 hours to arrive in Skipton.
Lake Goldsmith	DELWP	7,500 ML	Lake Goldsmith has a negligible impact on flooding along Mt. Emu Creek.
Jubilee Park Lake	Corangamite Shire Council	16 ML	Undertaking flood mitigation works in mid-2016 to increase the capacity of culverts along Montgomery Street has significantly reduced flooding caused by Jubilee Lake spills. These works have improved the conveyance of flows from Jubilee Lake to Mt. Emu Creek.
Camperdown Storage	Wannon Water	180 ML	The Camperdown storage is sited on a hill above town but the capacity is only of the order of 180 ML. Wannon Water maintain appropriate incident management plans for each site.

Lake Burrumbeet

Lake Burrumbeet is located 30 km north east of Skipton and has a full capacity of approximately 38,400 ML. Lake Burrumbeet receives inflows from Burrumbeet Creek, recorded via the Burrumbeet Creek stream gauge (236215) 500m east of the Lake. Refer to the map below.

When Lake Burrumbeet is full water can spill into Baillie Creek. During historic flood events, Lake Burrumbeet has contributed significant flows to Mt. Emu Creek via Baillie Creek. Hydraulic modelling undertaken as part of the Skipton Flood Investigation (Water Technology 2020) demonstrated that spills from Lake Burrumbeet cause a 10 cm increase in flood level at Skipton. Modelling of a 1 in 100 AEP flood event, when Lake Burrumbeet's initial storage level was empty, shows the outflow of Lake Burrumbeet of 864 ML/d. This was found to be negligible when compared to the broader Mt. Emu Creek flow, 2% of the total peak flow. This occurred 40 hours after Skipton reached its peak flow. When Lake Burrumbeet was assumed full, much larger flows spilled to Baillie Creek, causing an increase of 2,592 ML/d in peak flow at Skipton, 6% of the total peak flow. This corresponds to a 10 cm increase in flood level.

Currently there is no stream gauge monitoring available to measure Lake Burrumbeet and Baillie Creek flows that contribute to flooding in Skipton. DELWP install a Portable Automatic Logging System (PALS) stream gauge at Baillie Creek during times when there is high flood risk to provide warning and an indication flood magnitude for future flood events in Skipton.

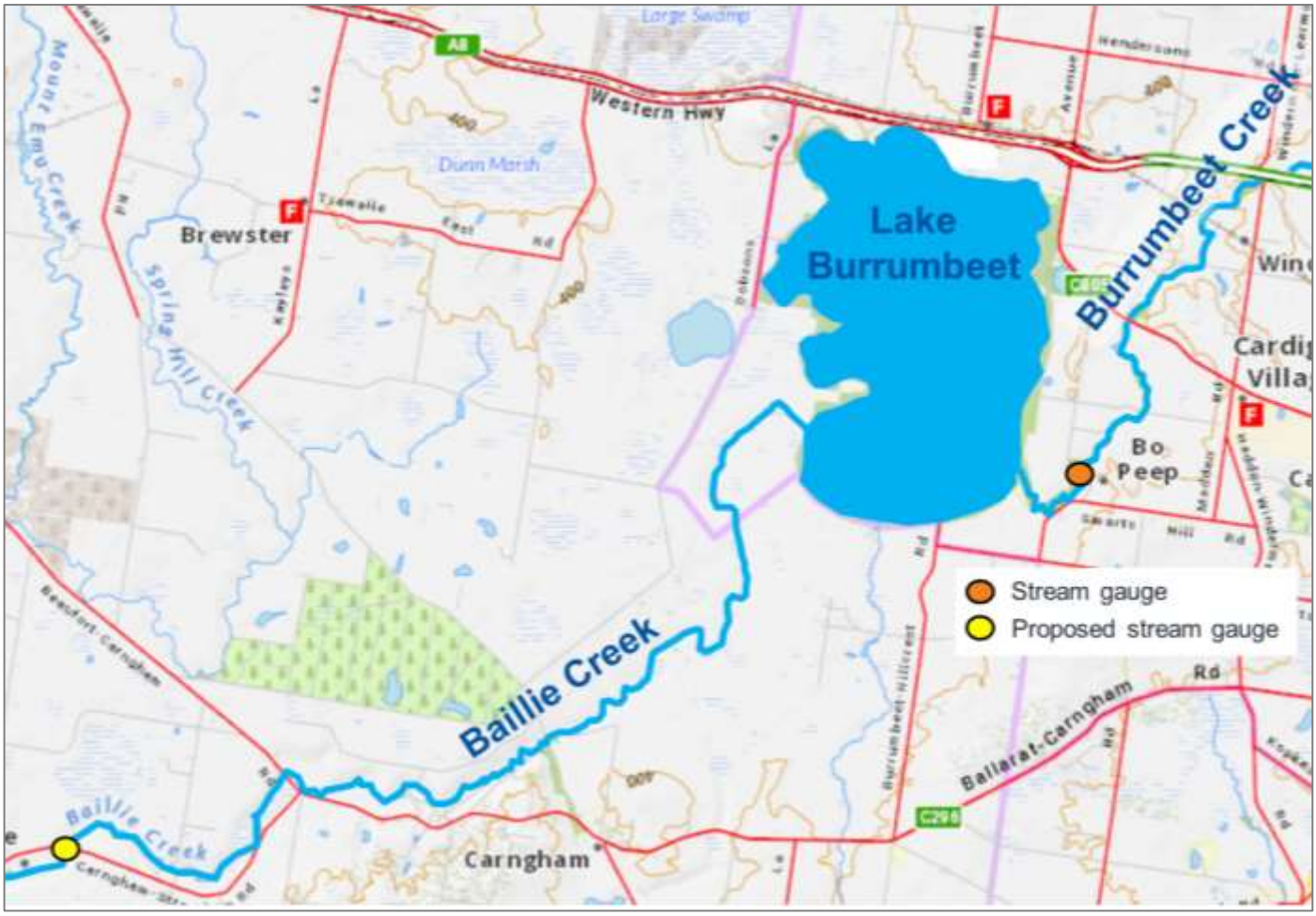

Figure 2. Lake Burrumbeet.

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Jubilee Lake (Skipton Dam)

The Jubilee Lake is located in Skipton at Jubilee Park, north of Montgomery Street, refer to the map below. Jubilee Lake has a storage volume of 16 ML, and a catchment area approximately 2.7 km^2. After heavy rainfall events, a waterway that flows through Jubilee Lake causes the Lake quickly fill and spill. During the September 2010 flood event, spills from Jubilee Lake flooded Anderson Street and Montgomery Street and flooded a number of adjacent properties.

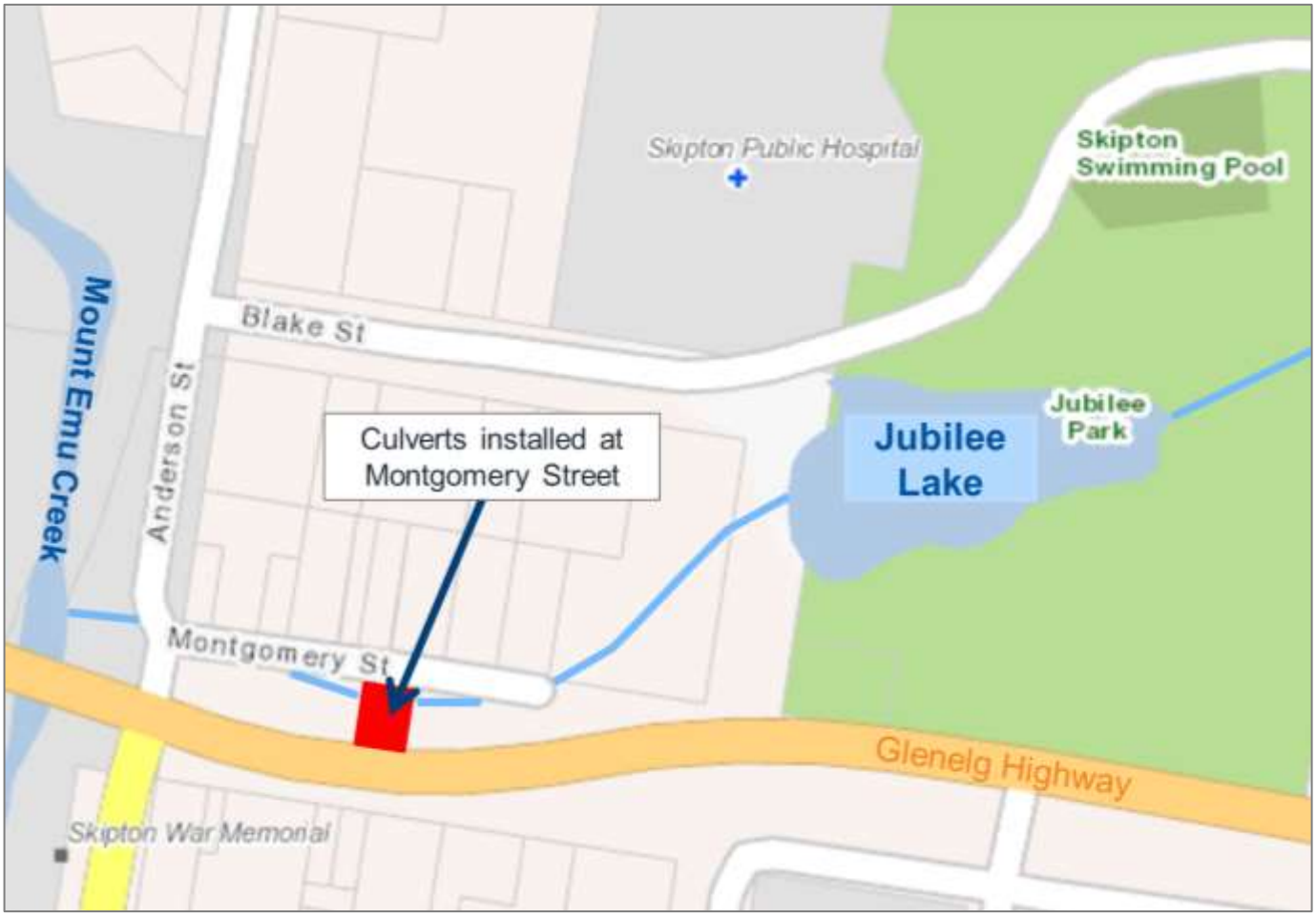


Figure 3. Jubilee Lake in Skipton.

However in mid-2016 mitigation works were undertaken to increase the capacity of culverts along Montgomery Street, refer to photo below. These works have significantly reduced flooding caused by Jubilee Lake spills, improving the conveyance of flows to Mt. Emu Creek.

The right hand abutment of the southern spillway suffered erosion during the January 2011 flood. This damage has been repaired. The Shire maintains a Dam Safety Emergency Plan for the Jubilee Lake.

Given the catchment size of the Jubilee Lake is small, flooding can develop quickly as a result of heavy rainfall. Heavy rainfall will quickly fill the Lake, causing spills within 0.5 to 6 hours, depending on rainfall intensity. It is important to note that the time it takes rainfall associated with severe thunderstorm activity to develop into runoff is highly dependent on antecedent conditions, the saturation of the catchment. A flood on a 'dry' waterway will travel more slowly than a flood on a 'wet' waterway.

Figure 4. New culverts in Montgomery Street, during the September 2016 flood event.

Lake Goldsmith

Lake Goldsmith is located 1.6 km west of Mt. Emu Creek and 15 km north of Skipton. Refer to Figure 5 map below. The capacity of Lake Goldsmith is 7,500 ML.

Hydraulic modelling undertaken as part of the Skipton Flood Investigation (Water Technology 2020) demonstrated that Lake Goldsmith had a negligible impact on the flood peak flow at Skipton regardless if the initial storage level was empty or full. Modelling of a 1 in 100 AEP flood event, when Lake Goldsmith was empty, shows that Lake Goldsmith was not filled and did not contribute flow to Mt. Emu Creek.

Modelling of a 1 in 100 AEP flood event, when Lake Goldsmith was full before an event shows that flow spilling into Mt Emu Creek was 43.2 ML/s. This is equivalent to 0.1% of the total peak flow. This shows that Lake Goldsmith contributes a negligible flow to Mt. Emu Creek during flood events.

Levees

There are no formal levees within the Corangamite Shire Council. An earthen levee has been constructed in Port Campbell to protect the caravan park from regular flooding from Port Campbell Creek. Refer to **Appendix C4** for more details regarding the Port Campbell levee.

Appendix B: Typical Flood Peak Travel Times

Table 4. Flood peak travel times.

Location From	Location To	Typical Travel Time	Comments	Duration
Cobden (Cobden Creek flowing through the Cobden Dam at Victoria Street)				
Start of rainfall	Cobden Dam at Victoria Street	1 – 1.5 hours	To steep rise. Volume of water in Cobden Dam prior to rain has little effect on flooding downstream.	1 day
Camperdown (stormwater flooding)				
Start of rainfall	Camperdown	1.5 – 6 hours	To steep rise	1 day
Terang (stormwater flooding)				
Start of rainfall	Terang	1.5 – 6 hours	To steep rise	1 day
Port Campbell (Port Campbell Creek)				
Start of rainfall	Port Campbell	3 - 6 hours	To steep rise	1 day
Start of rainfall	Port Campbell	6 - 9 hours	To peak	
Rural land along the lower Curdies River				
Start of rainfall	Curdie gauge	4-6 hours	To steep rise	1 day
Start of rise	Curdie gauge	2.5 days	To peak (during the 2018 flood event)	
Curdie gauge	Peterborough gauge	10 hours	To peak	
Skipton (Baillie Creek)				
Start of rainfall	Carngham – Streatham Road portable stream gauge	4.5 - 10.5 hours	To steep rise	2-3 days
Carngham – Streatham Road portable stream gauge	Skipton	20 - 34.5 hours	To peak at Skipton driven by Mt Emu Creek	
		3.5 - 5 hours	To peak at Skipton driven by Baillie Creek	

Location From	Location To	Typical Travel Time	Comments	Duration
Skipton (Mt. Emu Creek)				
Start of rainfall	Mena Park gauge	7 - 14.5 hours	To steep rise	2-3 days
Start of rainfall	Downstream of Cameron's Bridge portable stream gauge	8.5 - 20.5 hours	To steep rise	
Start of rainfall	Guthrie's Bridge gauge	5.5 - 18 hours	To steep rise	
Start of rainfall	Skipton	6.5 - 16 hours	To steep rise	
		47.5 - 63 hours	To peak	
Mena Park	Skipton	14.5 - 20.5 hours	To peak	2-3 days
Downstream of Cameron's Bridge portable stream gauge	Skipton	9.5 - 13.5 hours	To peak	
Guthrie's Bridge	Skipton	0.5 - 3.5 hours	To peak	
Skipton (Baillie Creek)				
Start of rainfall	Carngham – Streatham Road portable stream gauge	4.5 - 10.5 hours	To steep rise	2-3 days
Carngham – Streatham Road portable stream gauge	Skipton	20 - 34.5 hours	To peak at Skipton driven by Mt Emu Creek	
		3.5 - 5 hours	To peak at Skipton driven by Baillie Creek	
Rural land along the lower Gellibrand River				
Start of rainfall	lower Gellibrand River	10 - 14 hours	To steep rise	1-2 days
Start of rainfall	lower Gellibrand River	2 – 2.5 days	To peak	
Lake Corangamite (inflow from Woady Yaloak River and Pirron Yallock Creek)				
Start of rainfall	Lake Corangamite	Several years	To steep rise. Given the capacity of the Lake is 407,000 ML and the annual average inflow is 60,000 ML, it can take several years for flooding to occur.	Several months

Appendix C1: Skipton Flood Emergency Plan

Skipton has experienced extensive and frequent riverine flooding from the Mt Emu Creek. The upper reaches of the Mt. Emu Creek begins as a small waterway south of Lexton and flows through Langi Kal Kal, Trawalla, and Skipton. The catchment area of Mt. Emu Creek is approximately 3,150 km^2.

Mt. Emu Creek receives inflows from Baillie Creek and other minor waterways upstream of Skipton. The Baillie Creek catchment begins at Lake Burrumbeet and flows west where is joins Mt. Emu Creek 1.5 km north of the Guthries stream gauge. The total catchment area is around 160 km^2. During historic flood events spills from Lake Burrumbeet has also contributed significant flood flows to Skipton. Hydrologic modelling (Water Technology 2020) indicates that during the January 2011 flood event Baillie Creek contributed up to 37.5% of the peak flood flow in Skipton.

Skipton also experiences stormwater flooding, however mitigation works were undertaken to increase the capacity of culverts along Montgomery Street in mid-2016 have significantly reduced flooding caused by Jubilee Lake spills.

The January 2011 flood was the largest recent flood event recorded in Skipton. This flood event caused considerable damages to buildings, roads, bridges and other infrastructure. Deep flooding impacted a considerable number of buildings in Skipton's main street, including the supermarket, shops, Pharmacy, Skipton Hotel, Skipton Pottery, Historical Society and the Eel Factory. Access was cut in the main street, along the Glenelg Highway causing the town to be split in half. This flood caused significant long term financial and emotional hardship to the community.

There are three stream gauges along the Mt. Emu Creek that provide flood warning for Skipton, these include Mena Park, Guthries and Skipton. Two temporary stream PALs gauges can also be installed by DELWP (as needed) at Baillie Creek and along Mt. Emu Creek at Cameron Bridge. Rises in streamflow at Skipton can occur between 8 to 20 hours after rainfall in the upper catchment.

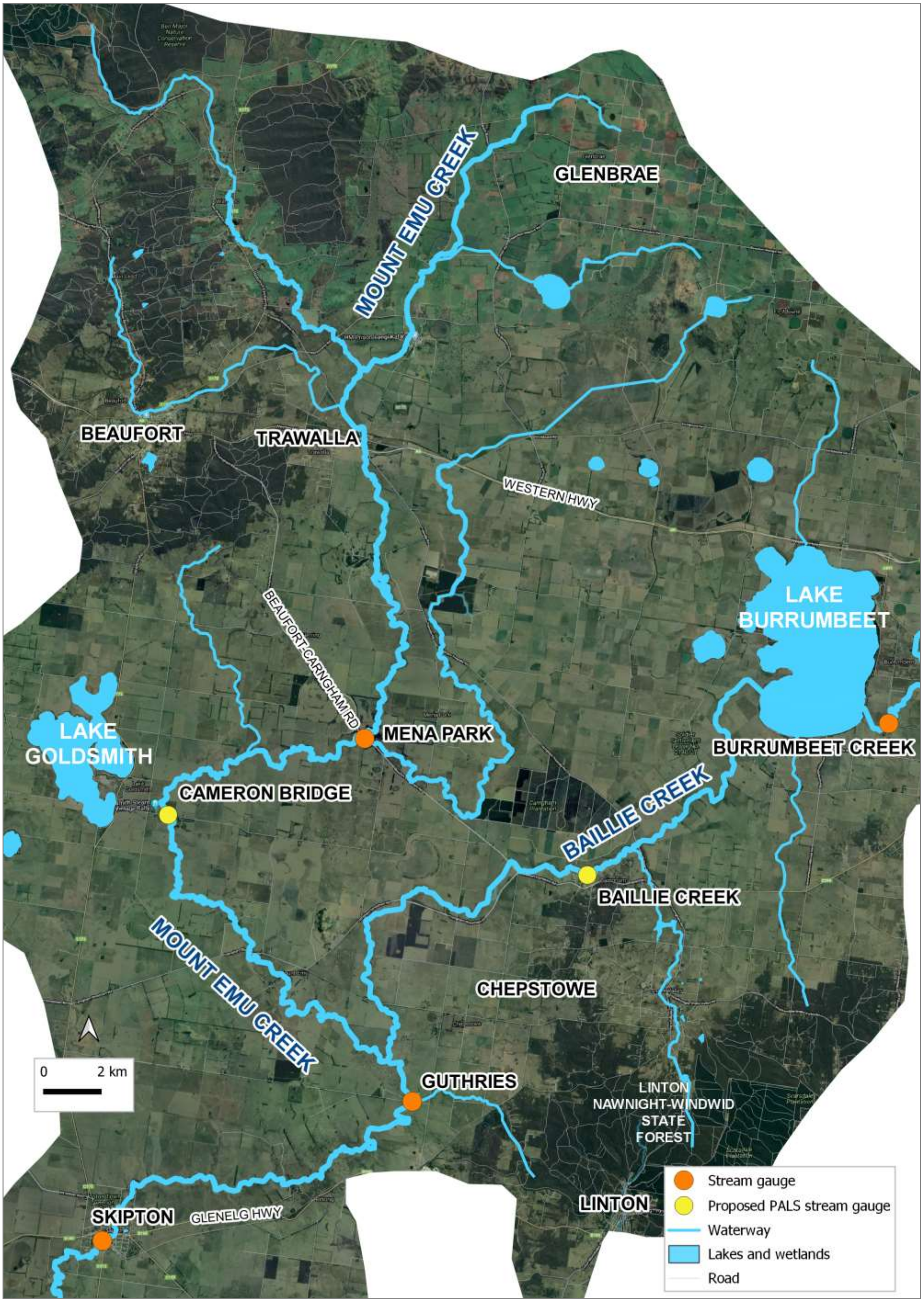


Figure 5. Skipton waterways and stream gauges.

Historic Flood Events

Skipton has experienced frequent and extensive flood events, refer to the graph below. Significant flood events have occurred in 1980, 1981, 1983, 1984, 1986, 1992, 1995, 1996, 2010, 2011, 2016 and 2019.

The Mt. Emu Creek stream gauge at Skipton was used to indicate historic flood events that have occurred in Skipton.

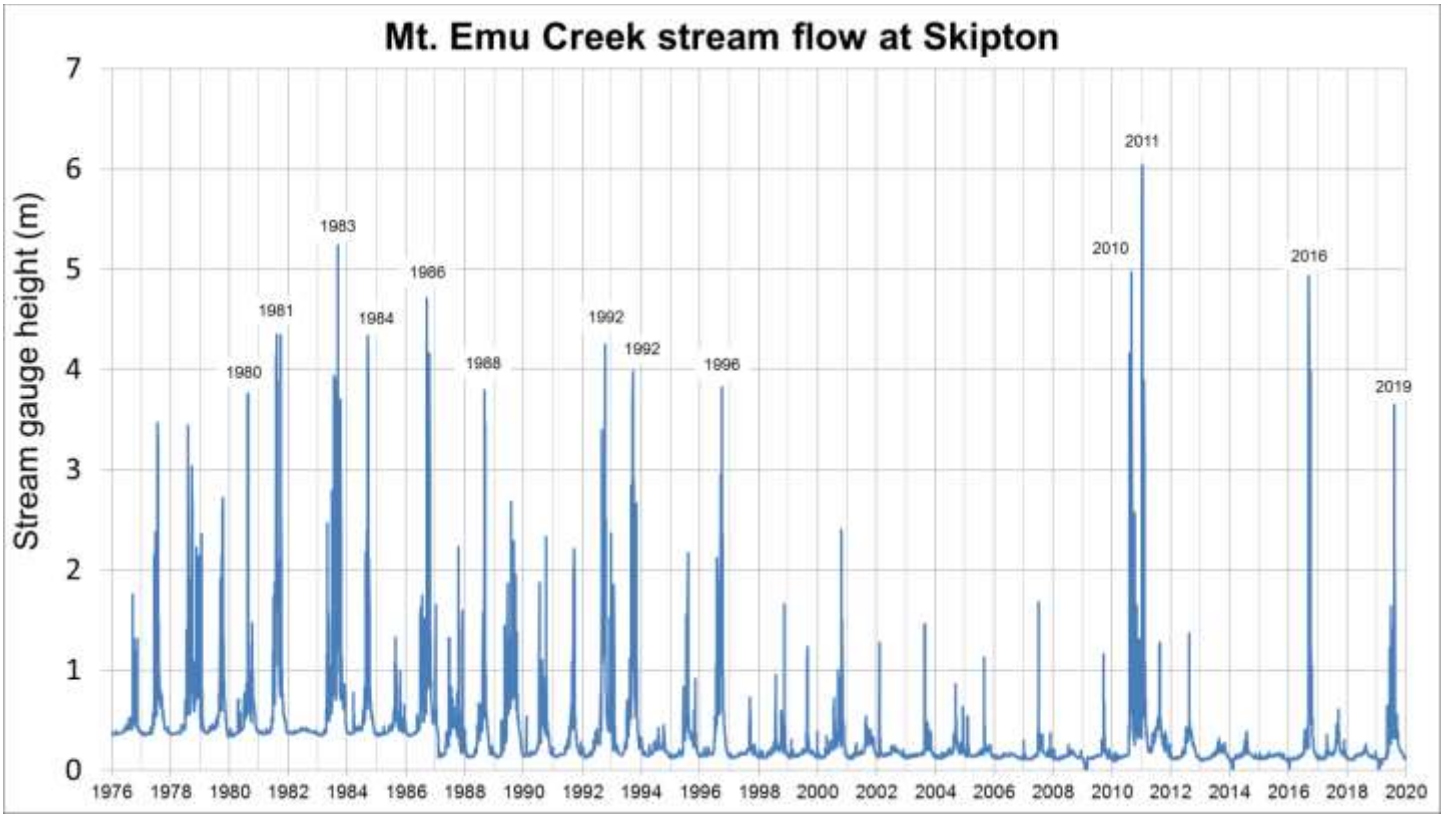


Figure 6. Skipton historic flood events.

The January 2011 flood was Skipton's largest recent flood event on record, estimated to be approximately a 1 in 100 AEP event. Prior to this flood event the catchment was already wet due to recent flood events in 2010. Skipton's recorded 145.5 mm of rainfall over 5 days, with 64 mm on the 14th of January. Other rainfall gauges in the Mt. Emu Creek Catchment recorded between 200 mm and 300 mm for the month. The highest daily rainfall was recorded on the 14th with 95 mm falling at the Ballarat Aerodrome. Significant flooding occurred in Skipton on the 15th of January 2011.

In Skipton, shops on the lower end of the main street, Montgomery Street were impacted by flooding, these included the Supermarket, Chemist, Skipton Hotel, Garage, Art Gallery, Eel Factory and Pottery were flooded in addition to 30 residential properties. Flood depths exceeded 1.5 m in some buildings. The Glenelg Highway Bridge was overtopped and the Highway was closed for more than two days. The town was split in half. This was the largest flood on record at Skipton. Refer to flood photos showing the impacts of flooding during the January 2011 flood event. For more details regarding flood impacts refer to the Skipton Flood Intelligence Card below.

Figure 7. Flooding impacting Skipton during the January 2011 event.

Figure 8. Flooding in Skipton along Montgomery Street (east) during the January 2011 event.

Figure 9. Flooding impacting Skipton during the January 2011 event.

Figure 10. Flooding in Skipton along Montgomery Street during the January 2011 event.

Figure 11. Flooding in Skipton during the January 2011 flood event (source: DSE).

Figure 12. Flooding in Skipton along Montgomery Street (west) during the January 2011 event.

The September 2016 flood event was relatively minor, and its impacts were largely mitigated by the completion of drainage works in Montgomery Street where culverts were installed to direct the overflow form the Juilee Park Lake into Mt Emu Creek. The highest daily rainfalls were recorded on the 14th Skipton 31.2mm and Ballarat Aerodrome 54mm.

Contribution of Baillie Creek

An analysis of hydrologic modelling (Water Technology 2020) shows that Baillie Creek can contribute significant flow to Mt. Emu Creek, significantly impacting Skipton during flood events. During the January 2011 flood event, Baillie Creek contributed approximately 37.5% of the peak flood flow in Skipton via Mt. Emu Creek. Refer to the table below.

Table 5. Contribution of Baillie Creek flow to flooding in Skipton.

Flood Event	Peak Flood Flow (ML/d)		% of Baillie Creek contribution
	Mt Emu Creek at Skipton	Baillie Creek	
January 2011	41,472	15,552	37.5%
1 in 20 year AEP (48 hour duration)	6,998	2,419	34.5%
1 in 100 year AEP (48 hour duration)	41,904	10,368	24.7%
September 2016	12,096	2,246	18%

Impact of Lake Spills

There are two major storages within the study area, Lake Burrumbeet and Lake Goldsmith. During flood events these storages could have the impact of, either spilling early in the event when full or storing flood water when empty. During the design hydraulic modelling, Lake Burrumbeet was modelled as at full capacity while Lake Goldsmith was modelled around 100mm below its capacity with no outflows observed entering the Mt. Emu Creek.

Lake Burrumbeet Impact

To test the sensitivity of Lake Burrumbeet's starting level on 1 in 100 year AEP flood level, the event was simulated in a hydraulic flood model (Water Technology 2020) with the initial starting level in Lake Burrumbeet was set as empty and full. When the initial Lake Burrumbeet level was modelled as empty, only minor spills from the lake occur and a negligible impact on peak flow at Skipton was observed. The peak outflow from Lake Burrumbeet was less than 10 m^3/s, which occurred 40 hours after Skipton reached its peak flow. Refer to the figure below. When Lake Burrumbeet began the flood event full, significant spills to Baillie Creek occurred, resulting in an increase in peak flow at Skipton of around 30 m^3/s, equivalent to around 10 cm increase in flood level.

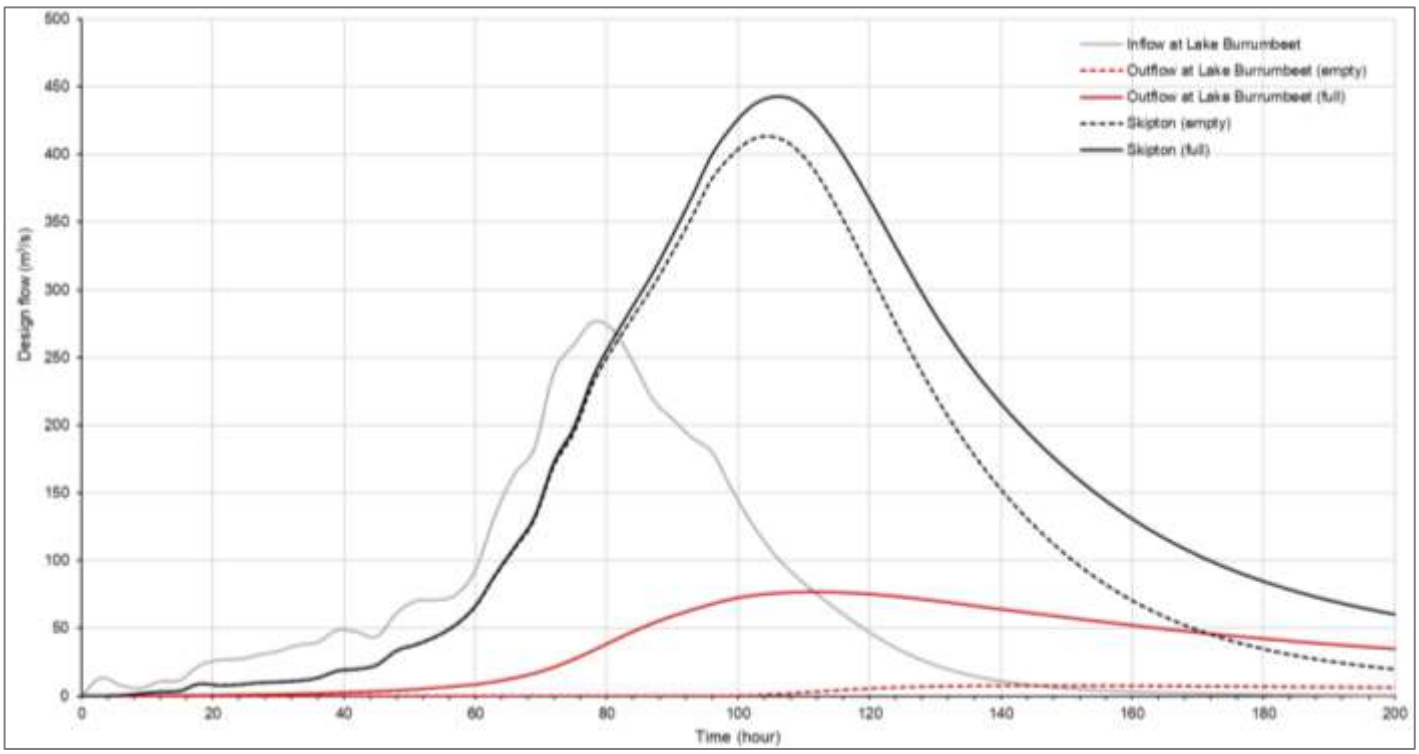


Figure 13. Sensitivity test on initial Lake Burrumbeet Storage. Stream gauge locations upstream of Dimboola.

Table 6. Summary of sensitivity test on Lake Burrumbeet Storage.

Inflow at Lake Burrumbeet (m^3/s)	Initial storage empty at Lake Burrumbeet		Initially storage full at Lake Burrumbeet	
	Outflow at Lake Burrumbeet (m^3/s)	Peak flow at Skipton (m^3/s)	Outflow at Lake Burrumbeet (m^3/s)	Peak flow at Skipton (m^3/s)
276.4	7.4	413.6	77.1	442.4

Lake Goldsmith Impact

Similar to sensitivity hydraulic model testing of Lake Burrumbeet, sensitivity testing of Lake Goldsmiths was also undertaken with the initial water levels set as empty and full was completed using the 1 in 100 year AEP event (Water Technology 2020). Modelling indicated the initial storage within Lake Goldsmith had a negligible impact on the peak flow at Skipton. When Lake Goldsmith was modelled as empty before 1 in 100 year AEP event, Lake Goldsmith did not fill or release any flows to the Mt. Emu Creek. When Lake Goldsmith is started as full, the flow contributed to Mt. Emu Creek was 0.5 m3/s. Refer to figure below. This shows that Lake Goldsmith contributes an insignificant proportion of the total Mt. Emu Creek design flow of 442 m3/s, 0.1%.

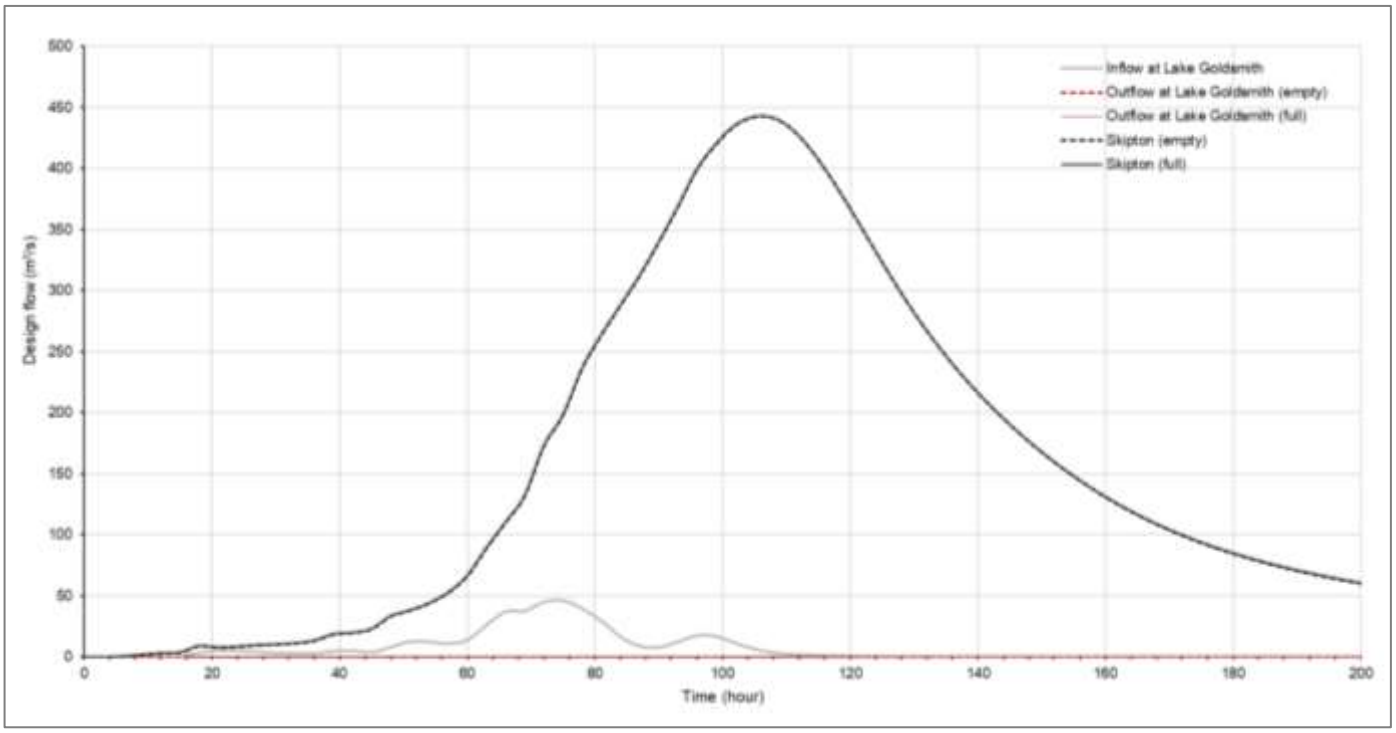


Figure 14. Sensitivity test on initial Lake Goldsmith Storage.

Table 7. Summary of sensitivity test on Lake Goldsmith Storage.

Inflow at Lake Goldsmith (m^3/s)	Initial storage empty at Lake Goldsmith		Initially storage full at Lake Goldsmith	
	Outflow at Lake Goldsmith (m^3/s)	Peak flow at Skipton (m^3/s)	Outflow at Lake Goldsmith (m^3/s)	Peak flow at Skipton (m^3/s)
45.7	0	442.3	0.50	442.8

Additional modelling was undertaken to determine the impact of a blockage of the Cameron Bridge on upstream and downstream water levels. Overall, the impact on upstream water levels was not significant, with an increase of 10 cm immediately upstream of the bridge, while the increase was less than 10 cm within the broader upstream floodplain and in the steam rally site.

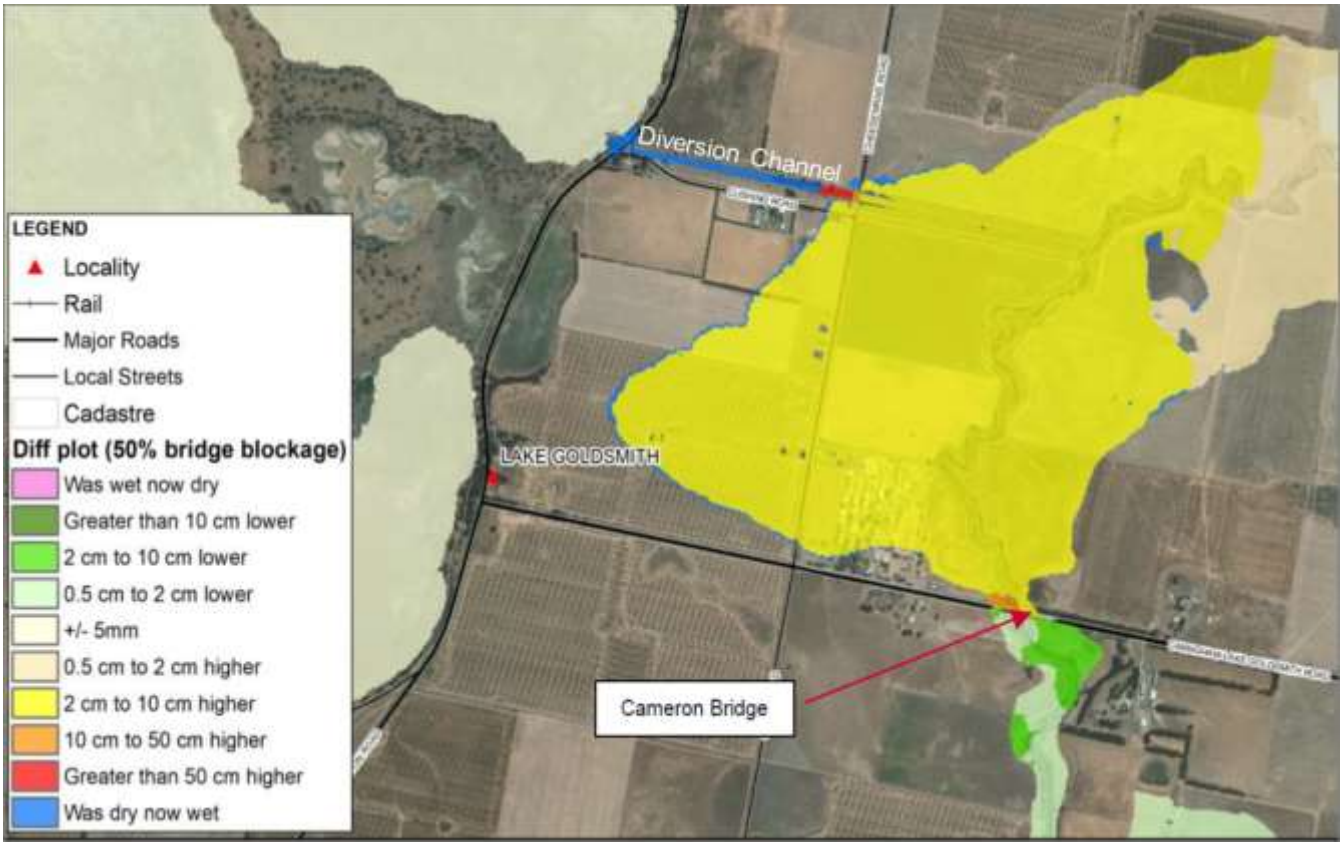


Figure 15. Modelling analysis of a blockage at Cameron Bridge at Lake Goldsmith.

Modelling of the Lake Goldsmith diversion channel both open and closed was completed for both 2016 and the 1 in 100 AEP events. The diversion channel in shown in blue in the map above adjacent to Cushing Road. This mitigation option aimed to evaluate whether opening of the channel could alleviate the flood levels at the steam rally site as the channel was closed during the 2011 flood event but open during 2016. Modelling demonstrated only minor reduction in water levels upstream of the channel. The diversion channel has a limited capacity and it cannot divert enough water to significantly reduce flood levels in Mt. Emu Creek. If this option is to be seriously considered, increasing the capacity of the channel is necessary. However, this would be a costly exercise and not significantly change the overall results given the relative comparison between the channel and the Mt. Emu Creek waterway and floodplain. This finding is identical to that determined during the Skipton Flood Study (Water Technology, 2013).

Flood Behaviour

If heavy rain is not localised, Mt Emu Creek rises and floods the commercial area along with additional properties via a combination of backflow through stormwater pipes and overbank flows. As creek levels rise, overbank flows occur into Stewart Park and flow breaks out of the creek opposite Stewart Park and flows south across the floodplain towards Smythe Street. Back flow then occurs through the drainage pipe on the right bank of the creek to the north of the Eel Factory which combines with a breakout from the channel further upstream. This water then flows southwards towards the Highway, inundating properties on the floodplain.

Flood Warning Time

There are three stream gauges along Mt. Emu Creek that provide flood warning, Mena Park, Guthries and Skipton. Currently there is no stream gauge monitoring available to measure Lake Burrumbeet and Baillie Creek flows that contribute to flooding in Skipton. DELWP can install two temporary Portable Automatic Logging System (PALS) stream gauges at Baillie Creek and Cameron Bridge during times when there is high flood risk. Refer to figure 5 above of the gauge locations.

Modelling showed that there is significant temporal variation of rainfall across the catchment area, which is a reason why there is significant variation in flood travel time between flood events, refer to model examples below. Modelling also showed that Lake Burrumbeet and Baillie Creek can contribute up to 37.5% of the total flood flow to Skipton. Rises in streamflow at Skipton can occur quickly in Skipton, between 8 to 20 hours after rainfall in the upper catchment.

January 2011

Modelled rainfall and stream flows during the January 2011 flood event is shown in the graph and table below. Rainfall records where use from the Beaufort (Sheepwash) gauge. Estimates for the proposed Cameron Bridge and Baillie Creek PALS stream gauge stations were also included.

The estimated time between a heavy rain in the upper catchment to a rise in the Skipton streamflow gauge was around 6.5 hours. The Skipton gauge peaked around 47.5 hours after the start of the rainfall. The estimated travel time between the Skipton gauge and Guthries Bridge gauge as measured by the flood peaks was around 3.5 hours during January 2011.

For Cameron Bridge, the estimated time between a heavy rainfall to a rise in the gauge is around 8.5 hours and it was peaked around 38 hours after the start of the rainfall. The estimated travel time between the Mena Park gauge and Cameron Bridge gauge was around 5 hours.

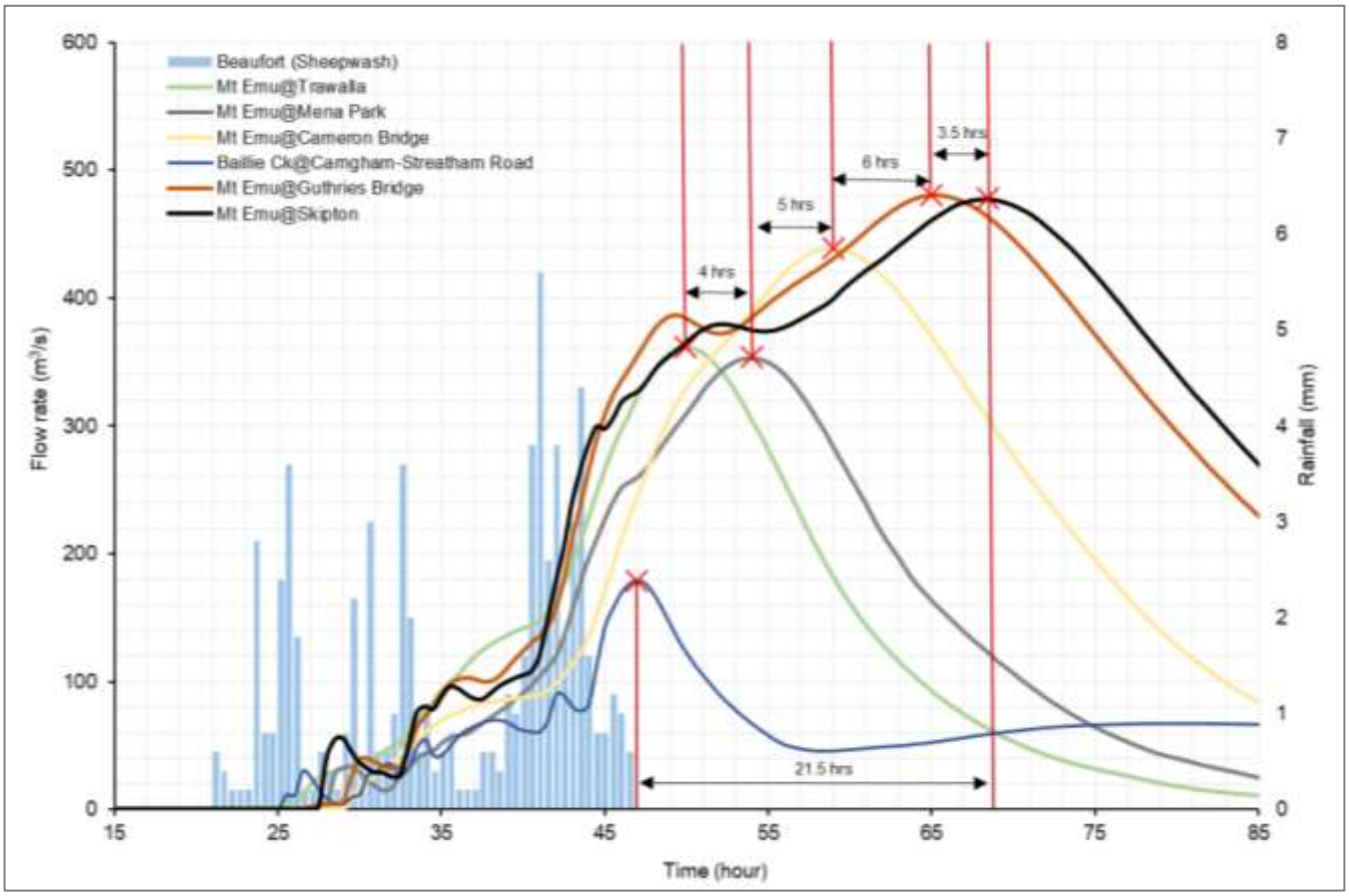


Figure 16. The travel time of flood peaks during the January 2011 flood event (Water Technology 2020).

September 2016

In contrast to the 2011 event, 2016 flooding was relatively minor. Modelled rainfall and stream flows during the September 2016 flood event is shown in the graph and table below.

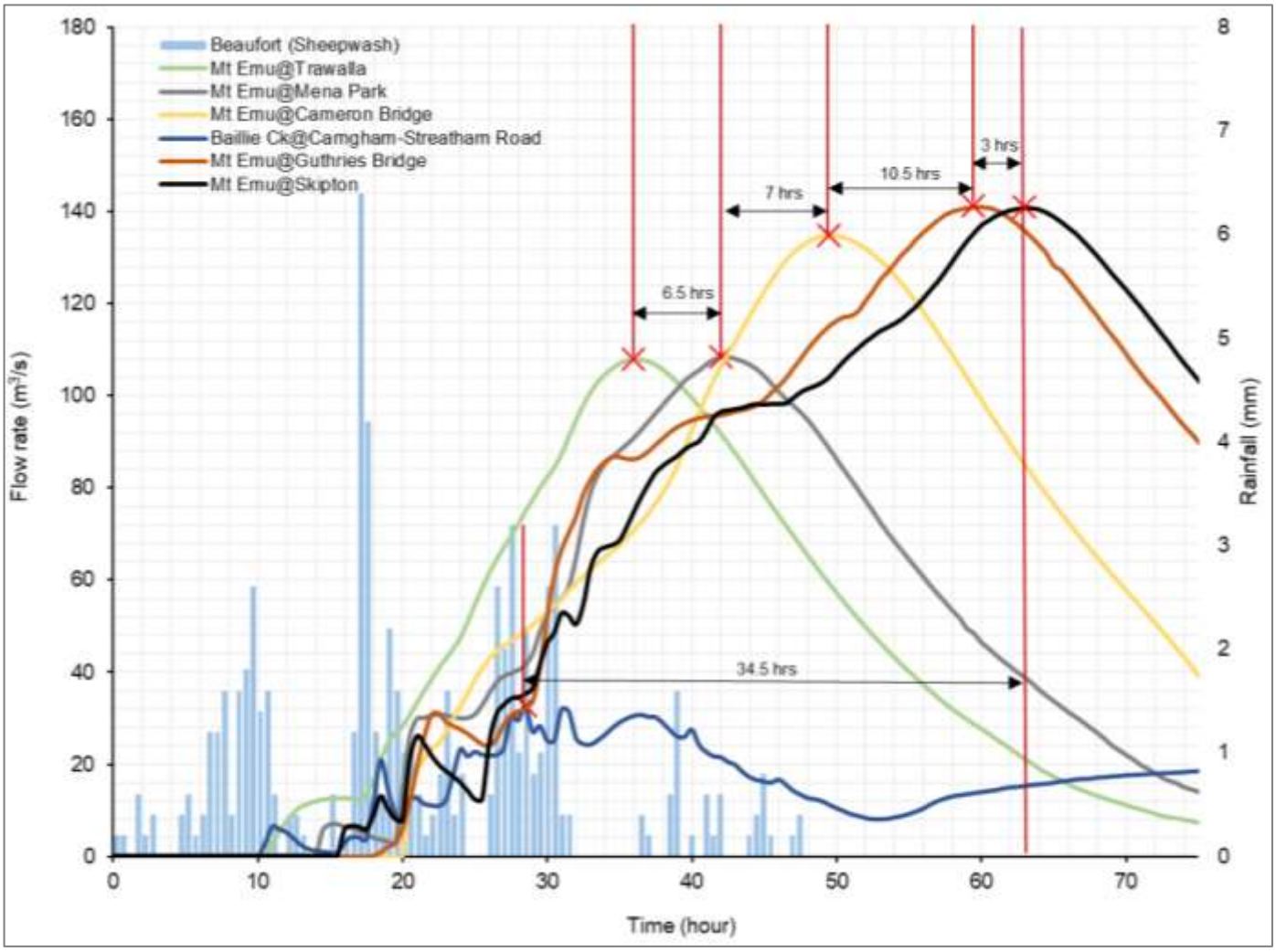


Figure 17. The travel time of flood peaks during the September 2016 flood event (Water Technology 2020).

Table 8. Travel time of flood peaks along Mt. Emu Creek and Baillie Creek (Water Technology 2020).

Location from	Location to	Travel time (hours)	
		January 2011 flood	September 2016 flood
Start of rainfall	Mt. Emu @ Mena Park	7 (to start of rise)	14.5 (to start of rise)
Start of rainfall	Mt. Emu @ Cameron Bridge	8.5 (to start of rise) 38 (to peak)	20.5 (to start of rise) 49.5 (to peak)
Start of rainfall	Mt. Emu @ Skipton	6.5 (to start of rise) 47.5 (to peak)	16 (to start of rise) 63 (to peak)
Mt. Emu @ Trawalla	Mt. Emu @ Mena Park	4	6.5
Mt. Emu @ Mena Park	Mt. Emu @ Cameron Bridge	5	7
Mt. Emu @ Mena Park	Mt. Emu @ Guthries Bridge	11	17.5
Baillie Ck @ Carngham-Streatham Road	Mt. Emu @ Guthries Bridge	18	31.5
Mt. Emu @ Guthries Bridge	Mt. Emu @ Skipton	3.5	3

September 2016

Various design flood event for different durations were also analysed to determine the variation in flood peak trammel times at the existing and proposed stream gauges along Mt. Emu Creek and Baillie Creek. Refer to graphs and table below.

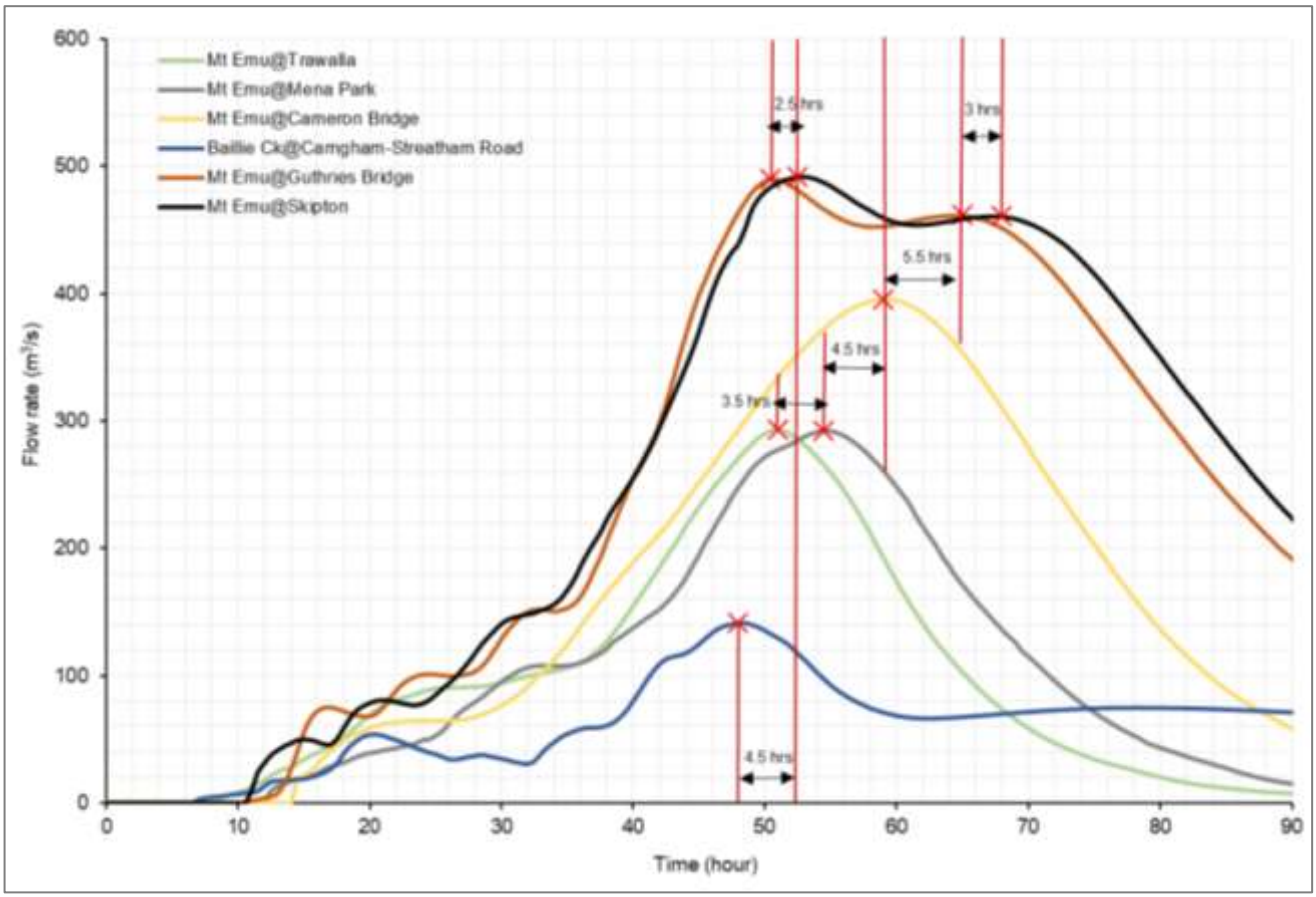


Figure 18. The travel time of flood peaks for a 1 in 100 year AEP flood, with a 48 hour duration (Water Technology 2020).

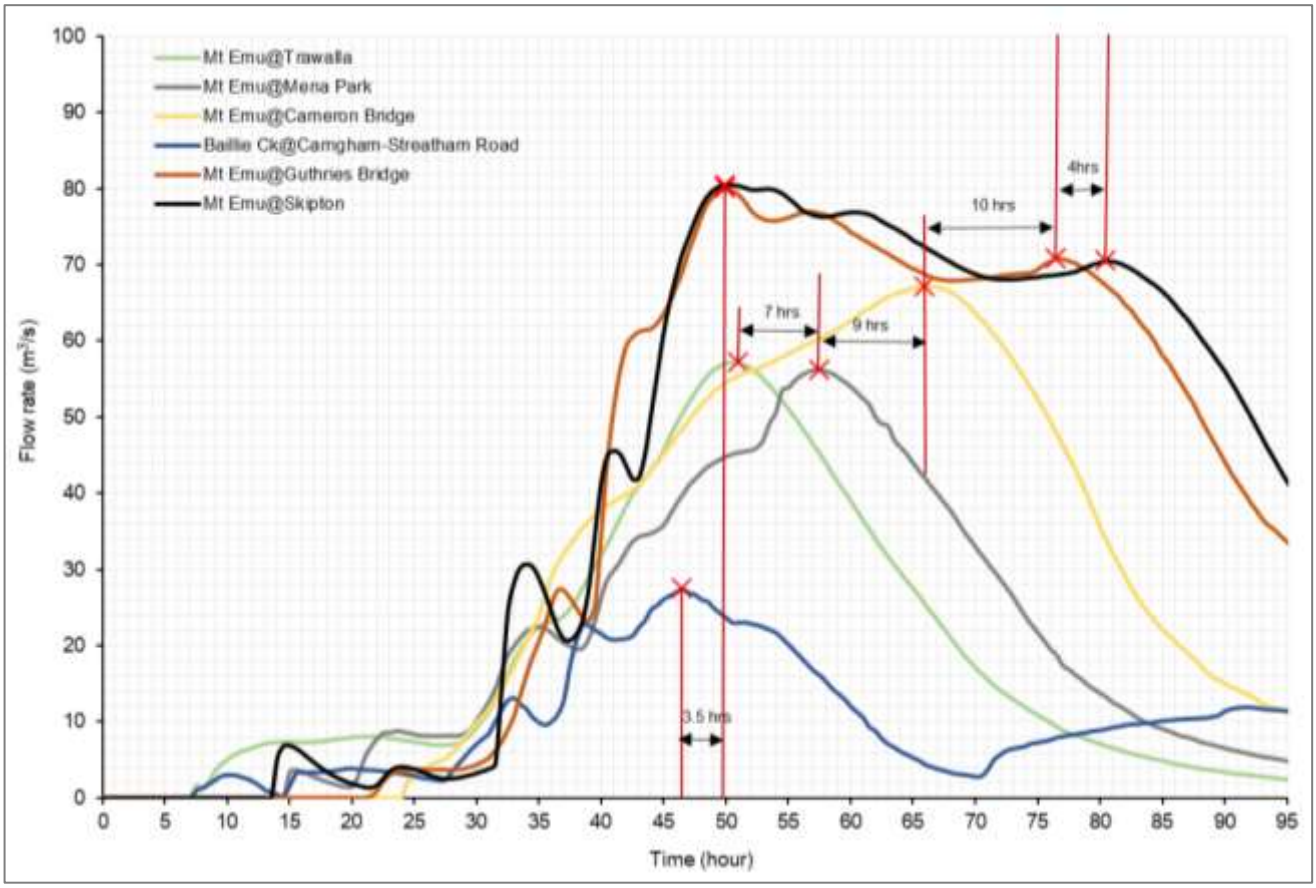


Figure 19. The travel time of flood peaks for a 1 in 20 year AEP flood, with a 48 hour duration (Water Technology 2020).

Table 9. Travel time of flood peaks along for a range of design events for different rainfall durations (Water Technology 2020).

Location from	Location to	Travel time (hours)				
		1 in 100 year AEP (96 hour)	1 in 100 year AEP (48 hour)	1 in 5 year AEP	January 2011 flood	September 2016 flood
Mt. Emu@Trawalla	Mt. Emu@Mena Park	2.5	3.5	7	4	6.5
Mt. Emu@Mena Park	Mt. Emu@Cameron Bridge	6	4.5	9	5	7
Mt. Emu@Mena Park	Mt. Emu@Guthries Bridge	16	10 (2nd peak)	19 (2nd peak)	11	17.5
Baillie Ck@Carngham-Streatham Road	Mt. Emu@Guthries Bridge	22	2 (1st peak) 16 (2nd peak)	3.5 (1st peak) 30 (2nd peak)	18	31.5
Mt. Emu@Guthries Bridge	Mt. Emu@Skipton	1.5	2.5	4	3.5	3

Proposed Skipton Relief Centres

When required the Corangamite Shire Council will activate the Skipton Relief Centre. During large flood event, when access is cut to the Glenelg Highway Bridge, there will be a need for two relief centres to be located to the east and west of Skipton. The locations of relief centres in Skipton may include;

- Skipton CFA Station, 56 Montgomery Street, Skipton.
- Skipton Football and Netball Clubrooms, 15 Smythe Street, Skipton.
- Skipton Swimming Pool Building, 1 Blake Street, Skipton.

A map of the proposed relief centre locations, refer below.

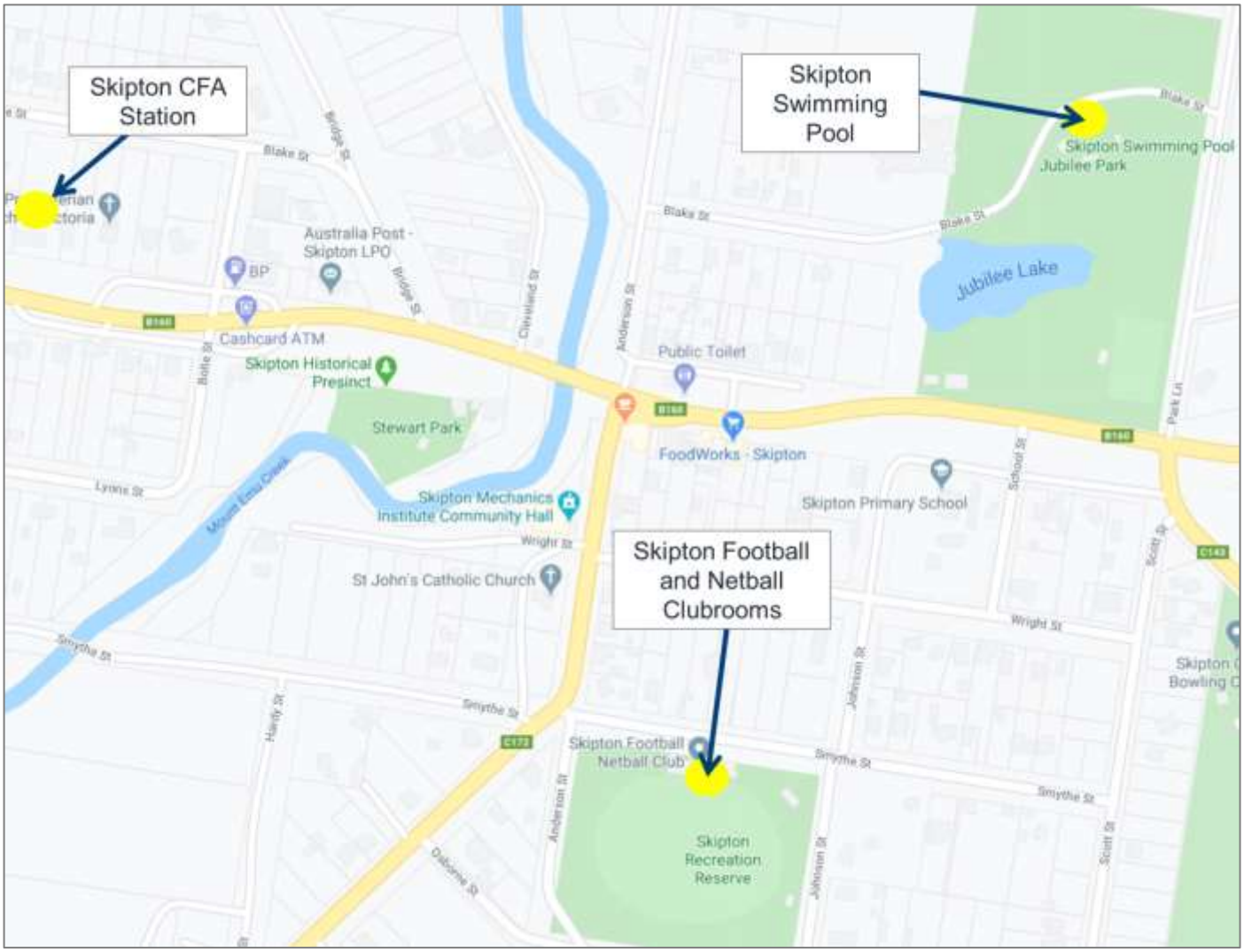


Figure 20. The proposed Skipton relief centre locations.

Flood Impacts and Actions Required

Flood mapping from the Mt. Emu Creek Flood Investigation (Water Technology 2020) was used to assess buildings, roads and other assets impacted by flooding.

During a 1 in 5 year flood event Smythe Street access is cut. A property at 1 Pett Street, north of Skipton is the first property to be impacted by flooding during a 1 in 10 year flood event.

During a 1 in 20 year flood event there is extensive over floor inundation of buildings and access is cut to most main and minor roads. Flooding causes 28 buildings to be flooded over floor in Montgomery Street, Cleveland Street, Bridge Road, Hardy Street and Pett Street. Flooding cuts access to Montgomery Street (the Glenelg Highway), Cleveland Street and Wright Street.

Key assets at risk of flooding in Skipton are listed below.

Table 10. Key assets at risk of flooding.

Asset register				
Asset Name and location	Annual Exceedance Probability (1 in year)	Consequence / Impact	Mitigation/ Action	Lead Agency
Smythe Street, south of Skipton.	5 year flood	Flooding cuts access to Smythe Street during a 5 year flood event, depth 2.34 m.	Deploy road closure signs as needed.	Council
Skipton Hotel (23 Montgomery Street) and a Shop (25 Montgomery Street), Skipton.	10 year flood	Anecdotal information from the Skipton CFA indicates that the Skipton Hotel (23 Montgomery Street) and a Shop (25 Montgomery Street) are at risk of over floor flooding during a 1 in 10 year flood event.	Pump floodwater away from the building as needed.	VICSES
Central Highlands Water Sewer Pump Station, corner of Montgomery Street and Cleveland Street.	10 year flood	Flooding may start to impact the Central Highlands Water Sewer Pump Station during a 1 in 10 year flood event.	Sandbag as needed.	VICSES
Wright Street, south of Skipton.	10 year flood	Flooding overtops Wright Street during a 10 year flood, depth 0.19m. Flooding cuts access to Wright Street during a 20 year flood event, depth 0.59m.	Deploy road closure signs as needed.	Council
1 Pett Street, north of Skipton.	10 year flood	A property is impacted by flooding, below floor at 1 Pett Street, during a 10 year flood event.	Evacuate as needed	Victoria Police
Department of Transport Lighting Control Box, near 31 Montgomery Street, Skipton	20 year flood	Flooding may start to impact the Regional Roads Victoria Traffic Control Box during a 1 in 20 year flood event.	Sandbag as needed.	VICSES
Central Highlands Water Sewer Pump Station at the rear of 7 Anderson Street, Skipton.	20 year flood	Flooding may start to impact the Central Highlands Water Sewer Pump Station at the rear of 7 Anderson Street during a 1 in 20 year flood event. This Station only services two properties.	Sandbag as needed.	VICSES
Telstra Telephone Box, Montgomery Street, Skipton.	20 year flood	Flooding may start to impact the Telstra Telephone Box during a 1 in 20 year flood event.	Sandbag as needed.	VICSES
Montgomery Street (the Glenelg Highway), Skipton.	20 year flood	Flooding cuts access to Montgomery Street (the Glenelg Highway), during a 20 year flood event, depth 0.42 m. This also cuts access Skipton in half isolating the eastern and western sections of Skipton.	Deploy road closure signs as needed. VICSES ensure agency staff are located on both sides of Mt. Emu Creek to assist the community.	Regional Roads Victoria
Anderson Street, Skipton.	20 year flood	Flooding overtops Anderson Street during a 20 year flood, depth 0.23m. Flooding cuts access to Anderson Street during a 50 year flood event, depth 0.80m.	Deploy road closure signs as needed.	Council

Asset register				
Asset Name and location	Annual Exceedance Probability (1 in year)	Consequence / Impact	Mitigation/ Action	Lead Agency
Hardy Street, Skipton.	20 year flood	Flooding overtops Hardy Street during a 20 year flood, depth 0.27m. Flooding cuts access to Hardy Street during a 50 year flood event, depth 0.81m.	Deploy road closure signs as needed.	Council
Cleveland Street, north of Skipton.	20 year flood	Flooding cuts access to Cleveland Street, during a 20 year flood event, depth 0.57 m.	Deploy road closure signs as needed.	Council
19 buildings, flooded above floor. Refer to the flood risk maps the flood intelligence table below for details.	20 year flood	19 buildings are flooded above floor during a 20 year flood event.	Sandbag and evacuate buildings as needed.	Victoria Police VICSES/ CFA
Skipton Healthcare Pharmacy (19 Montgomery Street), Skipton.	20 year flood	Flooding impacts the Skipton Healthcare Pharmacy above floor during a 20 year flood event.	Sandbag and evacuate building as needed.	Victoria Police VICSES/ CFA
Foodworks Supermarket, 15 Montgomery Street.	50 year flood	Flooding impacts the Foodworks Supermarket above floor during a 50 year flood event.	Sandbag and evacuate buildings as needed.	Victoria Police VICSES/ CFA

For more detailed information regarding buildings and roads impacted refer to the Skipton Flood Intelligence Card and flood impact maps below. Also refer to the Skipton flood depth maps in **Appendix F,** a list of flood observers in **Appendix G** and community sandbag collection point in **Appendix I**.

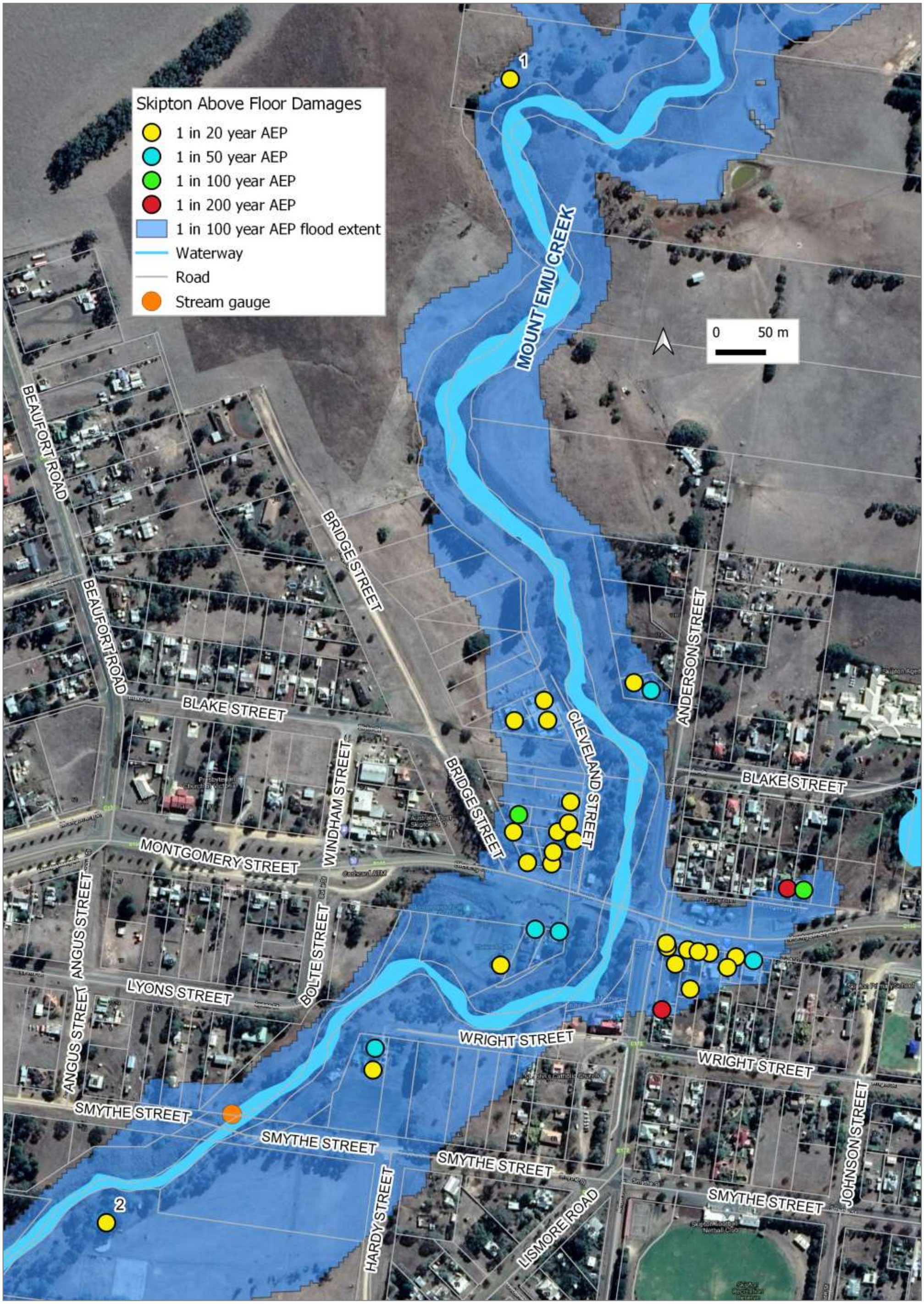


Figure 21. Skipton buildings impacted by over floor flooding for a range of design flood events (Water Technology 2020).

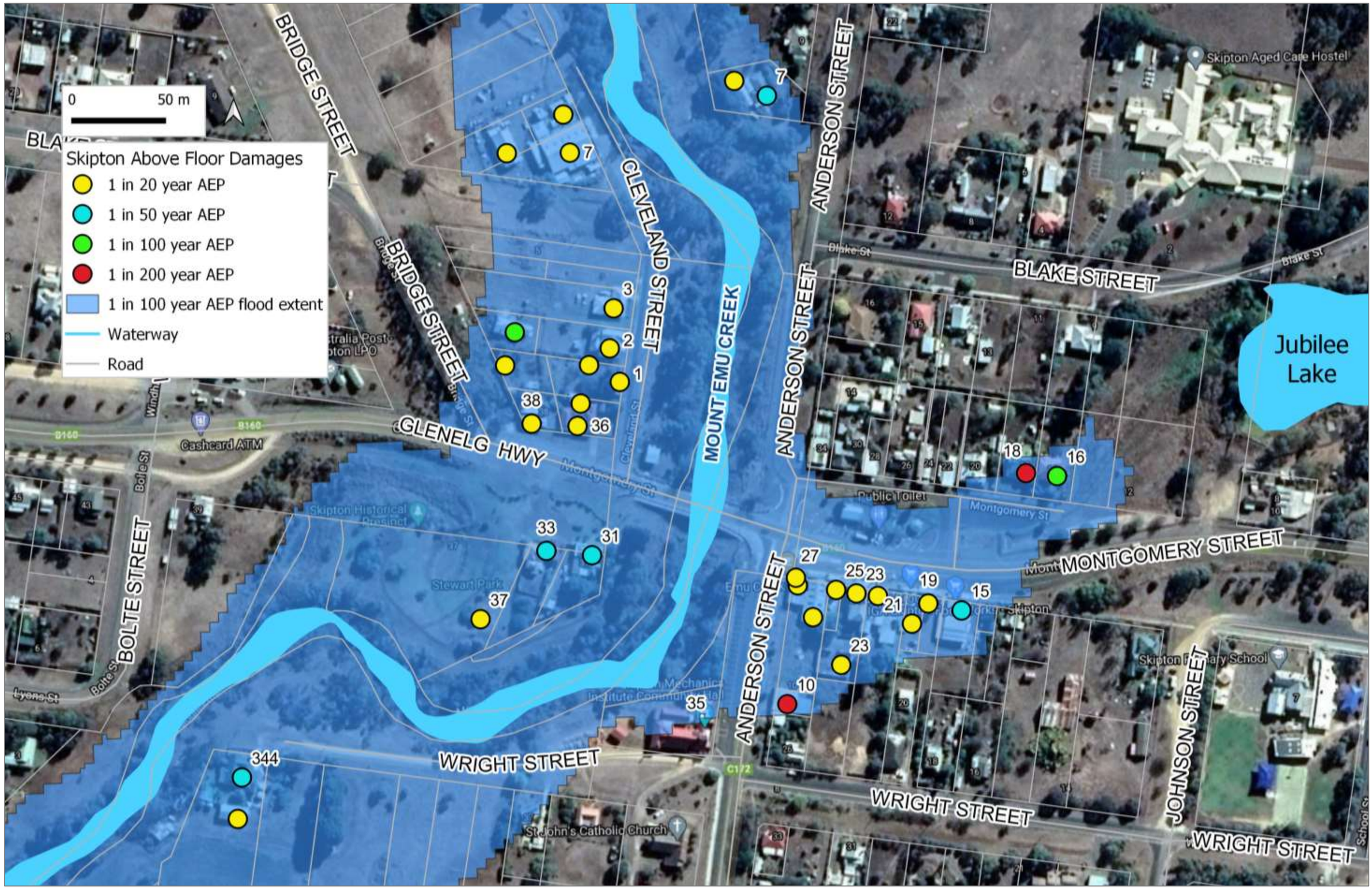


Figure 22. Skipton buildings impacted by over floor flooding for a range of design flood events (Water Technology 2020).

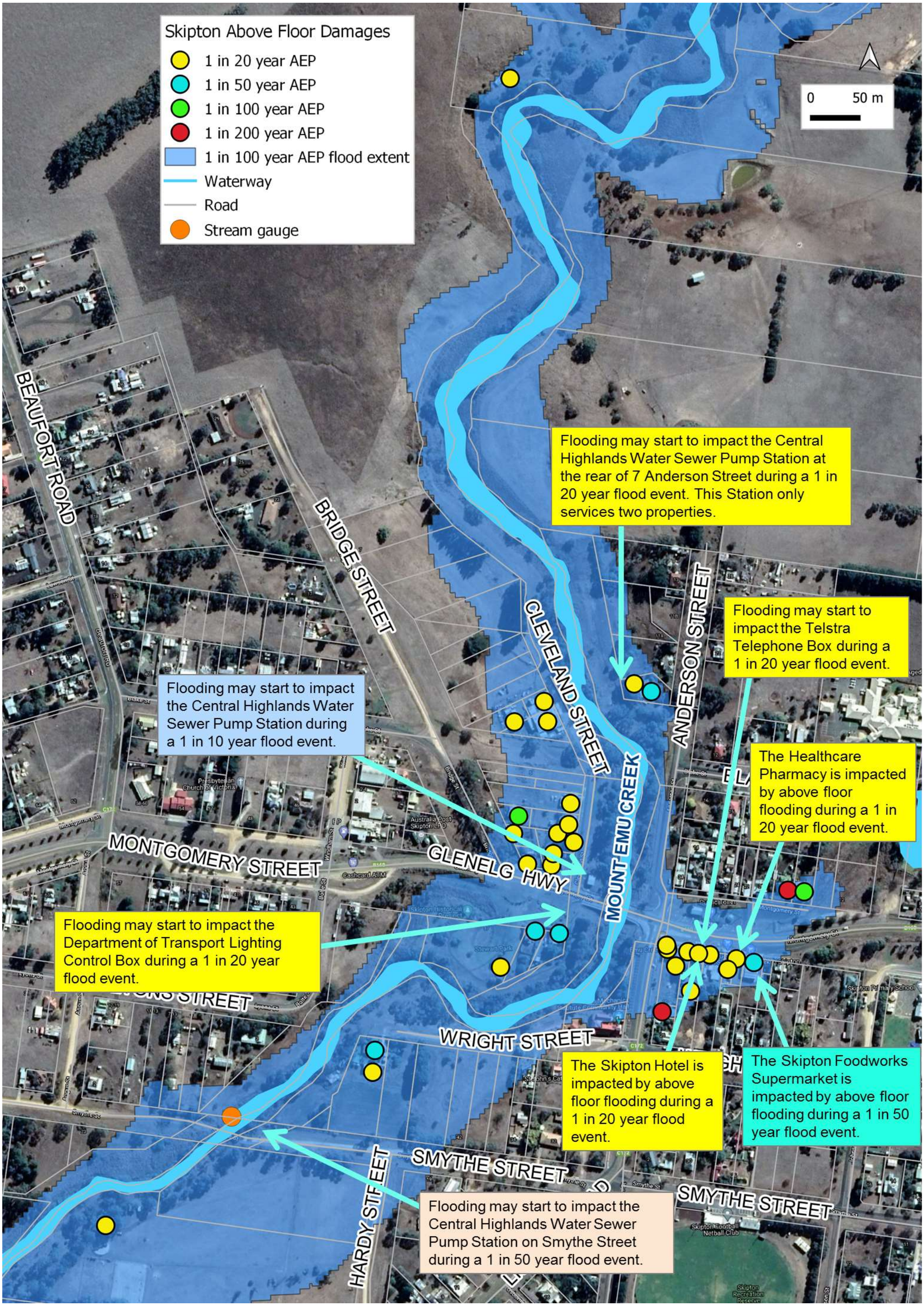


Figure 23. Skipton assets impacted by flooding with the 1 in 100 year flood extent (Water Technology 2020).

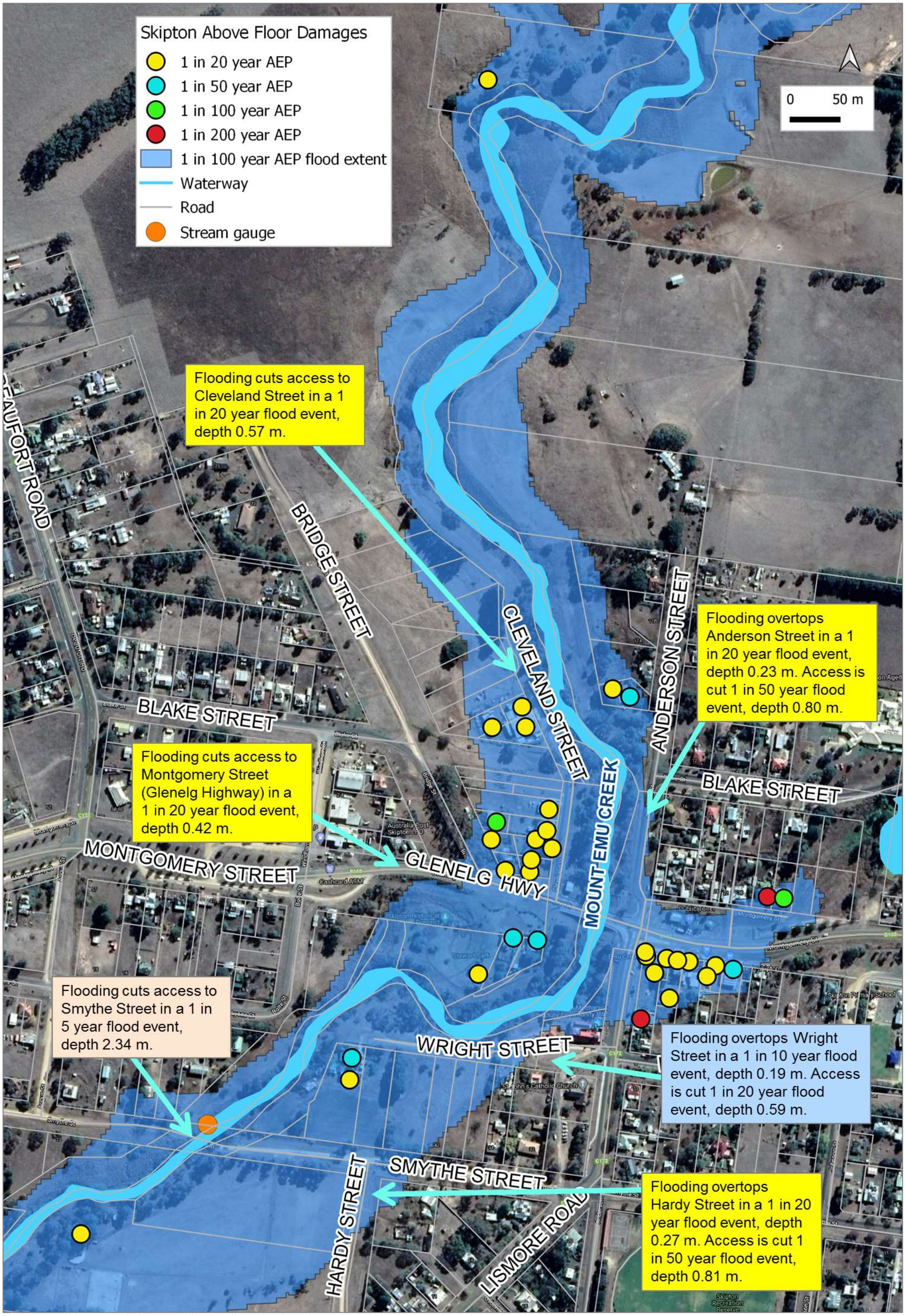


Figure 24. Skipton roads impacted by flooding with the 1 in 100 year flood extent (Water Technology 2020).

Table 11. Skipton Flood Intelligence Card (Mt. Emu Creek)

Flood travel time	
	Start of rainfall in the upper Mt. Emu Creek to steep rise in Skipton floodwater 14.5 to 20.5 hours.
	Start of rainfall in the upper Mt. Emu Creek to flood peak in Skipton 47.5 to 63 hours.
	Start of rainfall in upper Baillie Creek to peak in Skipton is 8 to 15.5 hours.
	Riverine flooding duration: 2-3 days

Proposed Baillie Creek at Portable Automatic Logger System (PALS) gauge height (m)	Mt Emu Creek at Mena Park gauge height 236216 (m)	Proposed Mt Emu Creek at Cameron Bridge PALS gauge height (m)	Mt Emu Creek at Guthrie's Bridge gauge height 236238 (m)	Mt Emu Creek at Skipton gauge height 236203 (m)	Annual Exceedance Probability (1 in year)	Mt Emu Creek flow at Skipton (ML/d)	Skipton damages total number properties flooded (above floor)	Consequence / Impact	Houses/ buildings flooded / isolated	Road flood depth (m)	Duration (hours)	Action
1.00	1.30	1.41	1.70	2.35	October 2020	1,613		Low flows, minimal flooding on low lying rural farmland.				
				4	Proposed Minor Flood Level							VICSES activate ground observers to take photos and record flood levels at key crossings. Council clear debris from waterway crossings, drains and culverts as needed.
				4.16	August 2010							
	2.34	3.08	3.08	4.18	5	6,998	1 (0)	Stewart Park fills early. No overbank flows of Mt. Emu Creek within Skipton. No properties flooded. Flooding overtops the Smythe Street Bridge, cutting access.		Smythe Street depth 2.34m Wright Street depth 0.0m Montgomery Street depth 0m Anderson Street depth 0m Blake Street depth 0m Lismore-Skipton Road depth 0m	65	Council deploy road closure signs as needed.
	2.75		3.88	4.88	September 2016		3 (2)	Floodwater breaks out from the eastern bank of Mt. Emu Creek. Flooding overtops Wright Street and Smythe Street. Floodwater flows southward and inundating property, 1 Pett St flooded below floor. Anecdotal information observed by the Skipton CFA indicates that two buildings are at risk of over floor flooding; the Skipton Hotel (25 Montgomery Street) and a Shop (25 Montgomery Street).	Two buildings are at risk of flooding; Skipton Hotel (23 Montgomery Street) and Shop (25 Montgomery Street).			VICSES & CFA to take action to undertake pumping to prevent the Skipton Hotel and Shop from flooding.
				4.7	Proposed Moderate Flood Level							
	2.53		3.91	4.89	10	12,441	3 (2)	Floodwater breaks out from the eastern bank of Mt. Emu Creek. Flooding overtops Wright Street. Floodwater flows southward and inundating property, 1 Pett St flooded below floor.	An additional property is impacted by flooding at 1 Pett Street.	Smythe Street depth 3.06m Wright Street depth 0.19m Montgomery Street depth 0m Anderson Street depth 0m	63	Council deploy road closure signs as needed.
				4.97	September 2010							
				5.1	Proposed Major Flood Level							
	2.67		4.84	5.23	20	19,526	32 (19)	Flooding breaks out of Mt. Emu Creek and flooding over 32 properties. 19 buildings are flooded above floor including the Healthcare Pharmacy (19 Montgomery Street), Eel Factory (7 Cleveland Street), Foodworks (existing 21 Montgomery Street), Art Gallery (36 Montgomery Street), Garage Workshop (29 Montgomery Street), Historical Society Museum (37 Montgomery Street), Skipton Pottery (29 Montgomery Street. Flooding cuts access to Wright Street, Montgomery Street, Hardy Street and Cleveland Street, and is close to cutting access to Anderson Street.	19 buildings may be flooded above floor; X10 Montgomery Street (19, 21, 27, 29, 36, 37), x4 Cleveland Street (1, 3, 5), 38 Bridge Road, 1 Pett Street, Lot 2 Hardy Street, Skipton Pottery (29 Montgomery Street, Eel Factory (7 Cleveland Street).	Smythe Street depth 3.36m Wright Street depth 0.59m Hardy Street depth 0.27m Montgomery Street depth 0.42m Cleveland Street depth 0.57m Anderson Street depth 0.23m	84 44 12 37	VICSES/CFA sandbag buildings as needed. Victoria Police evacuate buildings as needed. Council deploy road closure signs as needed. Council activate the Skipton Relief Centre.
	2.94		6.04	5.76	50	31,450	34 (24)	5 additional buildings are flooded above floor including the new Foodworks Supermarket (15 Montgomery Street). Flooding cuts access to Anderson Street, and is close to cutting access to Daly Road. There is significant flooding on both sides of Mt Emu Creek upstream and downstream of the Glenelg Highway. Flooding overtops the road approaching each side of the Glenelg Highway Bridge.	5 additional buildings may be flooded above floor; x2 Montgomery Street (31, 37), 44 Wright Street, 7 Anderson Street, Foodworks (new) (15 Montgomery Street).	Smythe Street depth 3.84m Wright Street depth 1.12m Hardy Street depth 0.81m Montgomery Street depth 1.01m Cleveland Street depth 1.19m Anderson Street depth 0.80m Daly Road depth 0.21m	94 57 44 49 50 47	Regional Roads Victoria deploy road closure signs and undertake traffic management for the Glenelg Highway, due to flooding impacting roads approaching the Glenelg Highway. Council deploy road closure signs as needed.

			6.53	6.04	January 2011			Shops in the lower part of Montgomery St including the supermarket, chemist, hotel, garage, art gallery and pottery were flooded along with 30 residential properties. Flood depths exceeded 1.5m on some properties. The Glenelg Highway Bridge was overtopped and the Highway was closed for more than 2 days. The town was split in two.				
	3.11		6.57	6.08	100	42,508	37 (26)	2 additional buildings are flooded above floor including the Skipton Lion's Club. Flooding overtops the Glenelg Highway Bridge cutting the town in two.	2 additional buildings may be flooded above floor; Skipton Lion's Club and 16 Montgomery Street.	Smythe Street depth 4.22m Wright Street depth 1.55m Hardy Street depth 1.22m Montgomery Street depth 1.50m Cleveland Street depth 1.66m Anderson Street depth 1.29m Daly Road depth 0.49m Pett Street depth 0.20m	121 74 56 70 67 57 26	Refer to actions listed above.
	3.18				January 2011							
	3.25		6.94	6.29	200	55,382	37 (28)	2 additional buildings are flooded above floor including the Crawford Dowling building.	2 additional buildings may be flooded above floor; Crawford Dowling and 18 Montgomery Street.	Smythe Street depth 4.43m Wright Street depth 1.77m Hardy Street depth 1.44m Montgomery Street depth 1.75m Cleveland Street depth 1.91m Anderson Street depth 1.54m Daly Road depth 0.67m Pett Street depth 0.57m	80 71 56 61 65 59 34 13	Refer to actions listed above.
	3.42		7.48	6.63	500	75,254	39 (28)		No additional buildings are flooded above floor.	Smythe Street depth 4.76m Wright Street depth 2.13m Hardy Street depth 1.80m Montgomery Street depth 2.15m Cleveland Street depth 2.30m Anderson Street depth 1.94m Daly Road depth 0.93m Pett Street depth 1.16m	104 88 73 76 82 74 48 24	Refer to actions listed above.

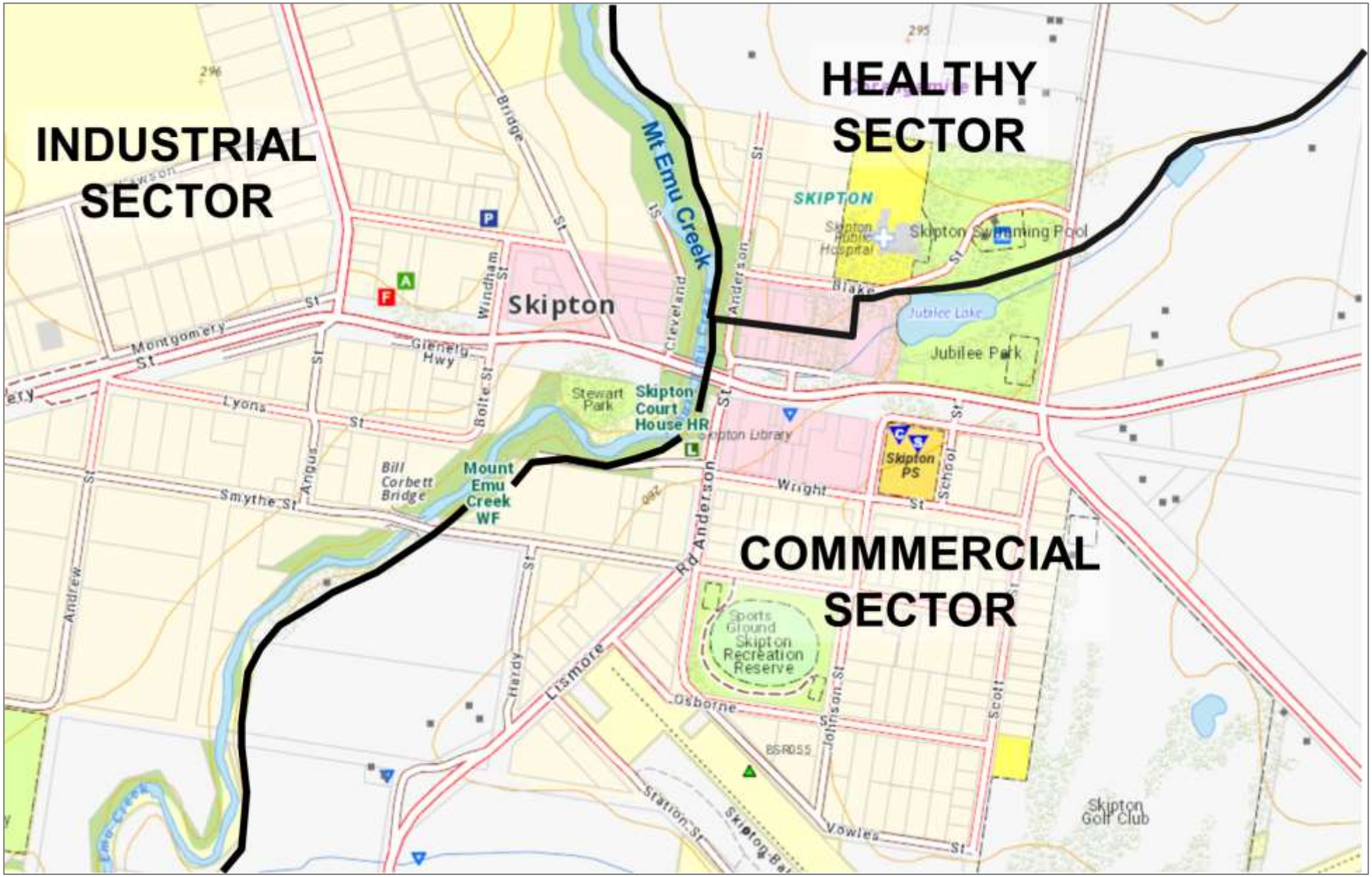
Table 12. Skipton Property Inundation Table (Water Technology 2020)

Colours used in the table below are the dame used in the Skipton flood risk maps above. Yellow, buildings flooded above floor in a 1 in 20 year AEP. Green, buildings flooded above floor iin a 1 in 50 year AEP flood event, etc.

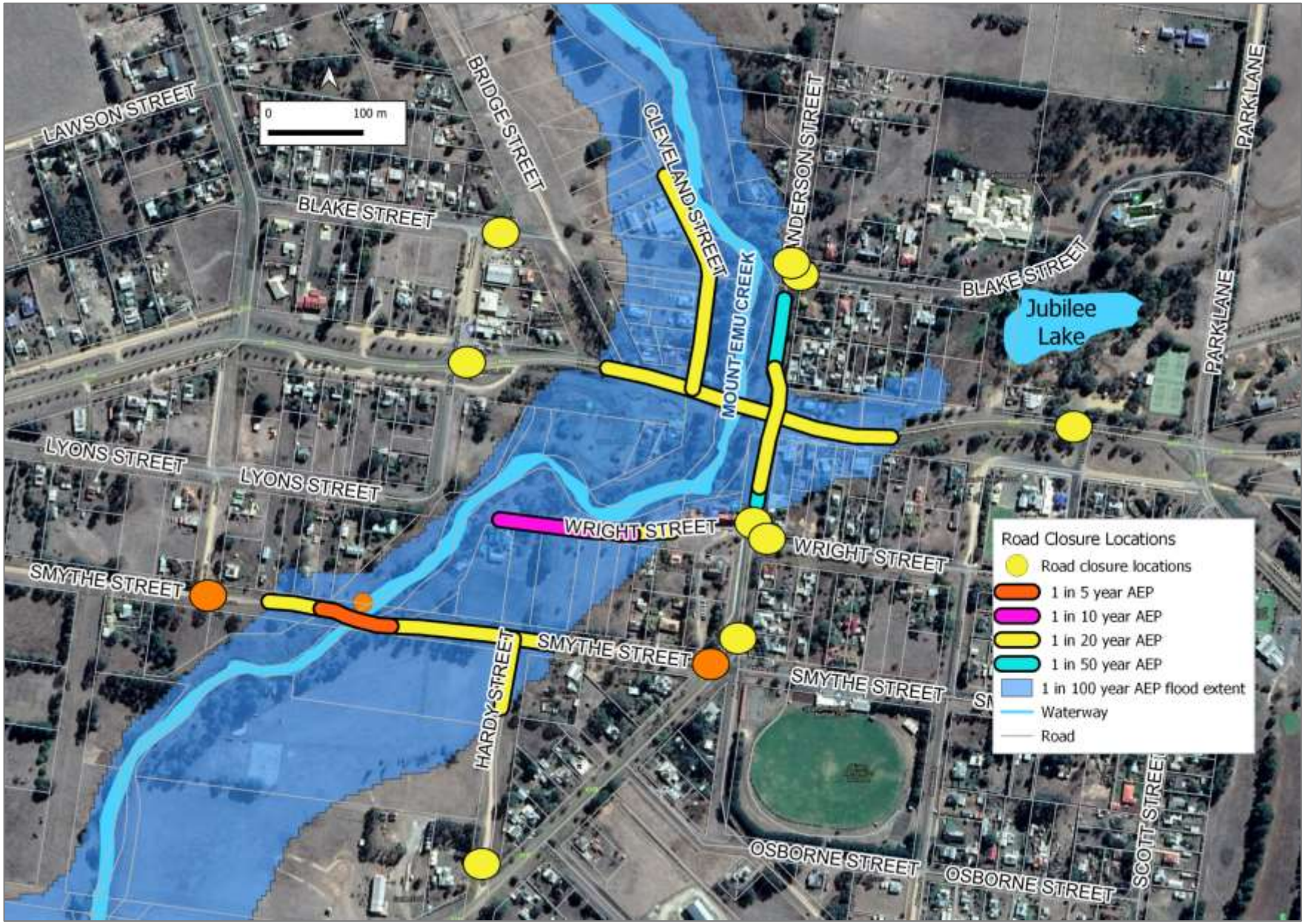
No	Address	Depth of building over floor flooding for each AEP (1 in year) event (m)					Type of building
		20	50	100	200	500	
1	38 Bridge Rd, Skipton	1.0	1.5	1.812	2.031	2.381	Residential
2	Art Gallery, 36 Montgomery Street, Skipton	0.662	1.2	1.51	1.73	2.087	Commercial
3	23 Montgomery St, Skipton	0.637	1.285	1.691	1.956	2.35	Bluestone Shed (no apparent floor level)
4	Garage (workshop), 29 Montgomery Street , Skipton	0.571	1.213	1.622	1.889	2.284	Commercial
5	Historical Society Museum, 37 Montgomery Street, Skipton	0.485	1.001	1.297	1.509	1.855	Commercial
6	1 Pett St, Skipton	0.481	1.411	1.972	2.357	2.95	Shed on stumps
7	23 Montgomery St, Skipton (anecdotal information indicates this building may be flooded at a 10 year flood event).	0.433	1.085	1.488	1.751	2.145	Render over brick (Hotel Dining Lounge)
8	23 Montgomery St, Skipton (anecdotal information indicates this building may be flooded at a 10 year flood event).	0.41	1.062	1.465	1.728	2.122	Bluestone (Skipton Hotel Bar)
9	25 Montgomery St, Skipton (anecdotal information indicates this building may be flooded at a 10 year flood event).	0.396	1.043	1.452	1.714	2.108	Weatherboard
10	Lot 2 Hardy St, Skipton	0.396	0.917	1.222	1.431	1.756	Commercial - Tin Shed 'Castlebar'
11	Healthcare Pharmacy, 19 Montgomery Street, Skipton	0.354	1.007	1.409	1.673	2.067	Commercial
12	Eel Factory, 7 Cleveland Street, Skipton	0.321	1.025	1.405	1.662	2.059	Commercial
13	1 Cleveland Street, Skipton	0.291	0.898	1.241	1.477	1.849	Old common school - Bluestone
14	Foodworks (existing), 21 Montgomery Street, Skipton	0.28	0.933	1.335	1.598	1.993	Commercial
15	3 Cleveland Street, Skipton	0.278	0.912	1.267	1.509	1.888	Residential
16	3 Cleveland Street, Skipton	0.262	0.87	1.216	1.453	1.827	Residential - Brickhouse
17	5 Cleveland Street , Skipton	0.155	0.811	1.175	1.422	1.806	Residential
18	Skipton Pottery, 29 Montgomery Street, Skipton	0.088	0.72	1.131	1.404	1.801	Commercial
19	27 Montgomery Street, Skipton	0.057	0.688	1.097	1.373	1.771	Commercial
20	31 Montgomery Street, Skipton		0.449	0.841	1.099	1.491	Residential
21	344 Wright Street, Skipton		0.431	0.773	1.008	1.373	Residential
22	7 Anderson Street, Skipton		0.418	0.799	1.058	1.461	Residential
23	33 Montgomery Street, Skipton		0.142	0.534	0.795	1.19	Residential
24	Foodworks (new) 15 Montgomery Street, Skipton		0.132	0.534	0.797	1.192	Commercial
25	Bridge Street, Skipton			0.161	0.418	0.82	Commercial
26	16 Montgomery Street, Skipton			0.05	0.313	0.707	Residential

No	Address	Depth of building over floor flooding for each AEP (1 in year) event (m)					Type of building
		20	50	100	200	500	
27	Crawford Dowling, 10 Anderson Street, Skipton				0.202	0.605	Commercial
28	18 Montgomery Street, Skipton				0.117	0.511	Residential

Skipton Mapping – Suggested sectors



Skipton Mapping – Suggested road closure points for flood events



Appendix C2: Camperdown Flood Emergency Plan

Camperdown is subject to stormwater flooding, overland flow from localised rainfall. When Camperdown's drains, culverts and channels reach capacity, floodwater from the stormwater drainage system overflows onto adjacent land. Stormwater flooding can develop quickly from heavy localised rainfall, within 1.5 to 6 hours depending on the rainfall intensity.

Anecdotal information provided by the VICSES Camperdown Unit and the VICSES Request for Assistance Database indicates that due to the flat landscape surrounding Camperdown nuisance flooding has impacted properties along Ware Street, Fuller Street, Bowen Street, Meiklejohn Street, Manifold Street, Cressy Street and Frederick Street. Some of these properties are situated in low lying areas, prone to flooding when there are significant rainfall events. During heavy rainfall events, the limited capacity of the stormwater drainage network and substantial local runoff often quickly floods a large number of roads and adjacent properties within Camperdown. Refer to the map below for the Camperdown stormwater flood risk areas.

The Corangamite Shire Council may have undertaken works to reduce flood risk in Camperdown following historic stormwater flood events listed below.

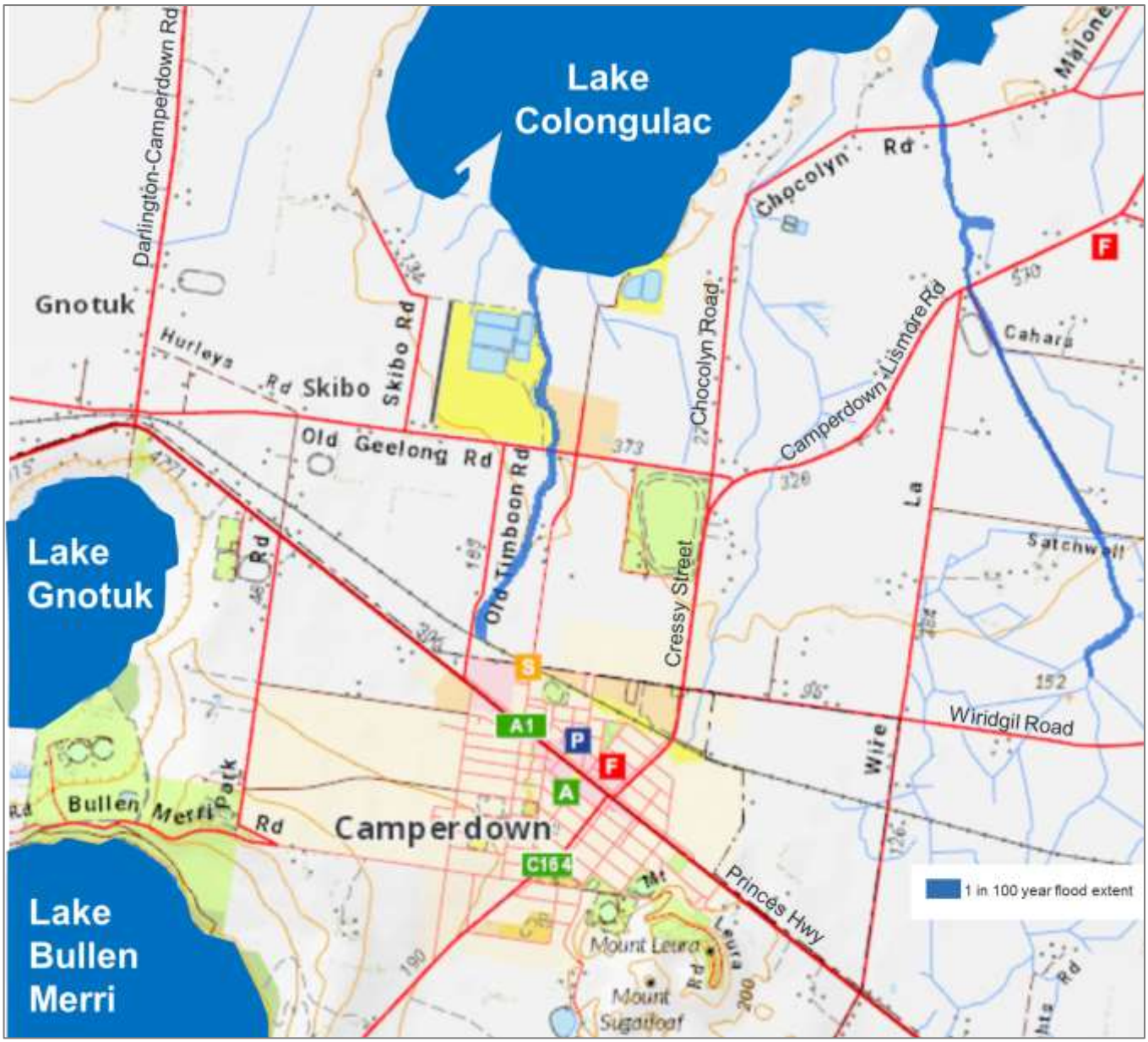


Figure 25. Lakes and waterways surrounding Camperdown (DNRE 2000).

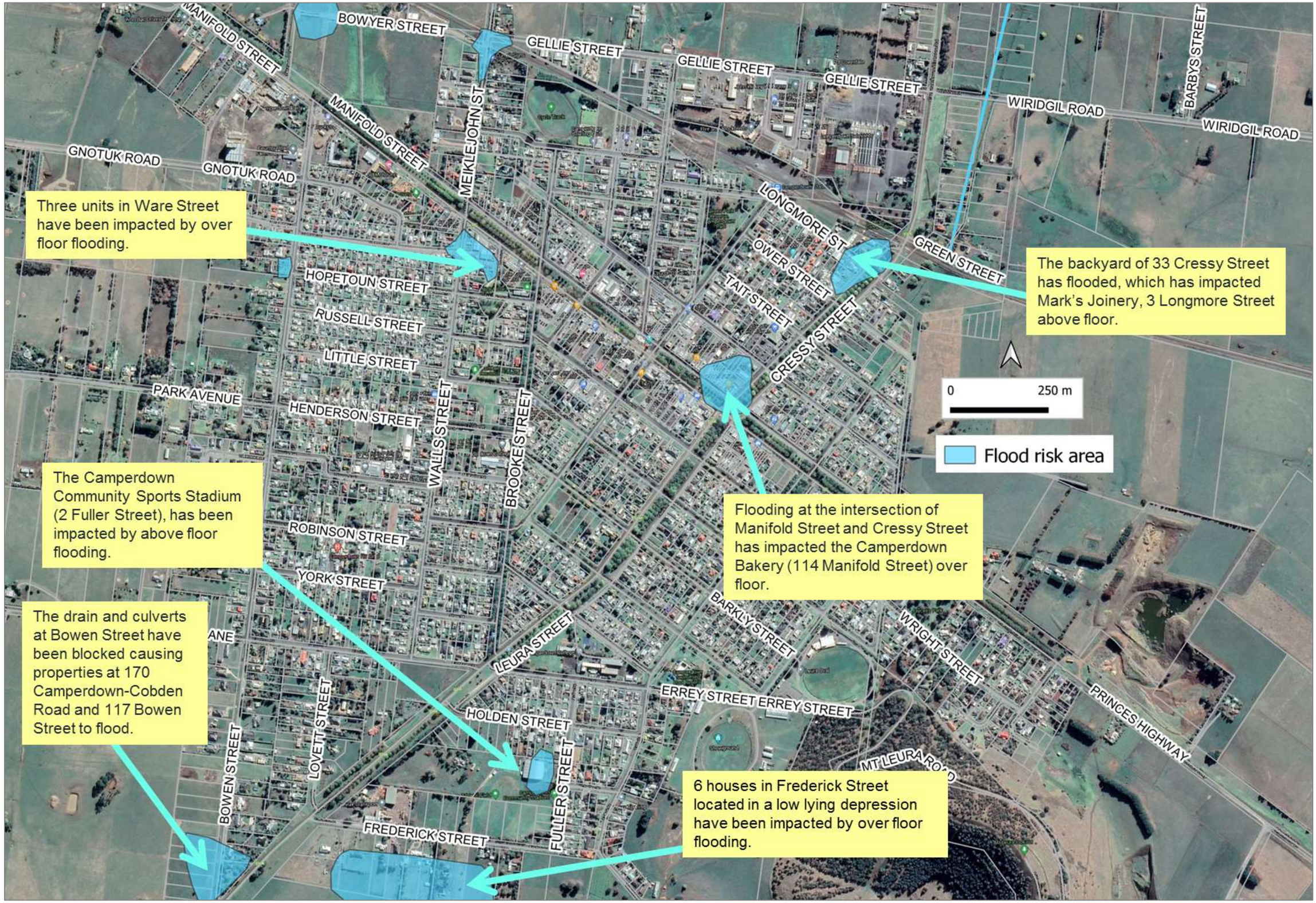


Figure 26. Area at risk of stormwater flooding in Camperdown (source VICSES Camperdown Unit).

Historic Stormwater Flood Events

Camperdown has been subject to irregular flood events. Significant stormwater flood events are known to have occurred in 1987, 1992, 2003, 2004, 2005, 2007, 2008, 2010 and 2011.

The January 2011 flood event was the largest recent flood event. Rainfall records indicate 122.2 mm fell over five days, with 56 mm falling on the 14th of January. This flood event caused considerable damages to buildings, roads and other infrastructure. Little detail is available regarding damages.

Records indicate that a significant stormwater flooding event occurred following heavy rain in April 1992. Rainfall records indicate 98.6 mm fell on the 6th of April. This flood event caused considerable damages to buildings, roads and other infrastructure.

Refer to the flood photos below of recent stormwater flooding in Camperdown.

For more details regarding buildings and roads prone to stormwater flooding, refer to the Camperdown Flood Intelligence Card below. Refer to the map above for areas prone to flooding.

Figure 27. Stormwater flooding along Bowen Street in mid-September 2020 came close to flooding a house above floor further down the hill (Colin Brian VICSES Camperdown Unit).

Figure 28. Stormwater flooding along a drain in Bowen Street mid-September 2020 (Colin Brian VICSES Camperdown Unit).

Stormwater Flooding Warning Time

Stormwater flooding can develop quickly in Camperdown from heavy localised rainfall. Rapid rises in stormwater flooding may occur in a relatively short time after onset of rain. Rapid rises in floodwater can occur within 1.5 to 6 hours after rainfall. It is important to note that all floods are different, and different rainfall patterns falling on dry or wet catchments may respond differently. This information should be used as a guide only. The time it takes rainfall associated with severe thunderstorm activity to develop into runoff is highly dependent on antecedent conditions, the saturation of the catchment. A flood on a 'dry' catchment travels more slowly than a flood on a 'wet' catchment. Hence, the size of the flood, recent flood history, soil moisture and forecast weather conditions all need to be considered when using the following information to direct flood response activities.

Camperdown Flood Impacts and Required Actions

Given that no flood study has been undertaken for stormwater flooding in Camperdown, flood risk information provided below was sourced from historic flood information provided by the Camperdown VICSES Unit, Corangamite Shire Council and the VICSES Request for Assistance Database. It's important to note the information used to estimate assets at risk of flooding below has a low level of accuracy and should be used as a guide only.

For additional flood risk information refer to the Camperdown Flood Intelligence Card, tables and maps below.

Key assets at risk of flooding in Camperdown are listed in the table below.

Table 17. Camperdown key assets at risk of flooding.

Asset register				
Asset Name and location	**Annual Exceedance Probability (1 in year)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Camperdown Bakery, 114 Manifold Street, Camperdown.	100 year flood (stormwater)	Flooding at the intersection of Manifold Street and Cressy Street has impacted the Camperdown Bakery (114 Manifold Street) over floor during a 100 year flood event.	Deploy road closure signs and sandbag building as needed.	Council VICSES
Camperdown Community Sports Stadium, 2 Fuller Street, Camperdown.	100 year flood (stormwater)	The Camperdown Community Sports Stadium has been impacted by above floor flooding during a 100 year flood event.	Sandbag building as needed.	VICSES
Mark's Joinery, 3 Longmore Street, Camperdown.	100 year flood (stormwater)	The backyard of 33 Cressy Street has flooded, which has impacted Mark's Joinery, 3 Longmore Street above floor during a 100 year flood event.	Sandbag building as needed.	VICSES
6 houses in Frederick Street, Camperdown.	100 year flood (stormwater)	6 houses in Frederick Street located in a low lying depression have been impacted by over floor flooding during a 100 year flood event.	Sandbag buildings as needed.	VICSES
Properties at 170 Camperdown-Cobden Road and 117 Bowen Street, Camperdown.	100 year flood (stormwater)	The drain and culverts at Bowen Street have been blocked causing properties at 170 Camperdown-Cobden Road and 117 Bowen Street to flood during a 100 year flood event.	Deploy road closure signs as needed.	Council
Three units in Ware Street, Camperdown.	100 year flood (stormwater)	Three units in Ware Street have been impacted by over floor flooding during a 100 year flood event.	Deploy road closure signs as needed.	Council

For more detailed information regarding buildings and roads impacted refer to the Camperdown Flood Intelligence Card below.

Table 13. Camperdown Flood Intelligence Card (Stormwater flooding)

Flood travel time	Time from start of rain to steep rise in floodwater 1.5 - 6 hours Flooding duration: 1 day					
Rainfall Intensity Triggers (BOM)	**Annual Exceedance Probability (1 in year)**	**^Camperdown estimated damages (buildings over floor)**	**Consequence / Impact**	**Houses/ buildings flooded / isolated**	**Roads Impacted**	**Action**
~46.7 mm in 12 hour to ~58.7 mm in 24 hours	5					
~56.3 mm in 12 hour to ~71.1 mm in 24 hours	10					
~66.3 mm in 12 hour to ~84.5 mm in 24 hours	20					
~80.8 mm in 12 hour to ~103 mm in 24 hours	50					
~92.9 mm in 12 hour to ~119 mm in 24 hours	100	20 (12)	Several buildings are prone to flooding in Camperdown, these include the Camperdown Bakery (114 Manifold Street), the Community Sports Stadium (2 Fuller Street), 6 houses in Frederick Street, 3 units in Ware Street and Mark's Joinery (3 Longmore Street). Several properties are prone to flooding, these include 170 Camperdown Stormwater flooding in Camperdown mostly impacts local minor and major roads.	Several buildings are prone to above floor flooding; Camperdown Bakery (114 Manifold Street), the Community Sports Stadium (2 Fuller Street), 6 houses in Frederick Street, 3 units in Ware Street and Mark's Joinery (3 Longmore Street). Several properties are prone to flooding; 170 Camperdown-Cobden Road, 117 Bowen Street and 33 Cressy Street.	Roads that may be impacted by flooding; Camperdown-Cobden Road, Bowden Street, Cressy Street, Manifold Street, Frederick Street, Ware Street, Fuller Street, Longmore Street Bowyer Street, Gellie Street Meiklejohn Street Dawson Street.	Council and Regional Roads Victoria deploy road closure signs as needed. VICSES sandbag buildings as needed.
98.6 mm fell on the 6th of April	April 1992	20 (12)	This flood event caused significant impacts to the local road network within Camperdown.			

^ Estimated property and building damages using historic flood events request for assistance and anecdotal information provided by the Camperdown VICSES Unit and the Corangamite Shire Council.

Appendix C3: Terang Flood Emergency Plan

Terang is subject to stormwater flooding, overland flow from localised rainfall. When Terang's drains, culverts and channels reach capacity, floodwater from the stormwater drainage system overflows onto adjacent land. Stormwater flooding can develop quickly from heavy localised rainfall, within 1.5 to 6 hours depending on the rainfall intensity.

Anecdotal information provided by the VICSES Terang Unit and the VICSES Request for Assistance Database indicates that due to the flat landscape surrounding Terang, frequent nuisance flooding regularly occurs along roads and land surrounding the Terang Golf Course and the Terang Pony Club. They are situated within the Terang Lake. During heavy rainfall events, the limited capacity of the stormwater drainage network and substantial local runoff often quickly floods a large number of roads and adjacent properties within Terang. Refer to the map below for the Terang stormwater flood risk areas.

The Corangamite Shire Council may have undertaken works to reduce flood risk in Terang following historic stormwater flood events listed below.

Figure 29. Area at risk of stormwater flooding in Terang (source VICSES Terang Unit).

Historic Stormwater Flood Events

Terang has been subject to irregular flood events. Significant stormwater flood events are known to have occurred in 1987, 1991, 2003, 2004, 2005, 2007, 2008, 2010 and 2011.

The January 2011 flood event was the largest recent flood event. Rainfall records indicate 116 mm fell over five days, with 52 mm falling on the 12th of January. This flood event caused considerable damages to buildings, roads and other infrastructure. Little detail is available regarding damages.

Records indicate that a significant stormwater flooding event occurred following heavy rain in January 1991. Rainfall records indicate 93 mm fell on the 24th of January. This flood event caused considerable damages to buildings, roads and other infrastructure. The paddocks to the north of town became flooded. Floodwater was approximately 300mm deep over a wide area near the railway line and north of Black Street. The drains along Blackiston Street and Black Street were unable to accommodate the flow. Little detail is available regarding damages.

Rainfall records for the February 2005 flood event indicate 74.4 mm fell over three days, with 54 mm fell on the 3rd of February. A building at 147 Peterborough Road was flooded above flood in 2005 due to flow across the intersection of the Peterborough Road and the Cobden – Terang Road.

For more details regarding buildings and roads prone to stormwater flooding, refer to the Terang Flood Intelligence Card below.

Stormwater Flooding Warning Time

Stormwater flooding can develop quickly in Terang from heavy localised rainfall. Rapid rises in stormwater flooding may occur in a relatively short time after onset of rain. Rapid rises in floodwater can occur within 1.5 to 6 hours after rainfall. It is important to note that all floods are different, and different rainfall patterns falling on dry or wet catchments may respond differently. This information should be used as a guide only. The time it takes rainfall associated with severe thunderstorm activity to develop into runoff is highly dependent on antecedent conditions, the saturation of the catchment. A flood on a ‘dry’ catchment travels more slowly than a flood on a ‘wet’ catchment. Hence, the size of the flood, recent flood history, soil moisture and forecast weather conditions all need to be considered when using the following information to direct flood response activities.

Terang Flood Impacts and Required Actions

Given that no flood study has been undertaken for stormwater flooding in Terang, flood risk information provided below was sourced from historic flood information provided by the Terang VICSES Unit and the VICSES Request for Assistance Database. It's important to note the information used to estimate assets at risk of flooding below has a low level of accuracy and should be used as a guide only.

For additional flood risk information refer to the Terang Flood Intelligence Card, tables and maps below.

Key assets at risk of flooding in Terang are listed in the table below.

Table 17. Terang key assets at risk of flooding.

Asset register				
Asset Name and location	**Annual Exceedance Probability (1 in year)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Cameron Street, Terang	10 year flood (stormwater)	Cameron Street is prone to flooding adjacent to the south side of the Terang Railway Line. When the culvert is blocked, flooding is likely on the eastern side of Cameron Street.	Deploy road closure signs as needed.	Council
Shadforth Street, Terang	10 year flood (stormwater)	Shadforth Street is prone to flooding adjacent to the Terang Railway Line.	Deploy road closure signs as needed.	Council
20 Swanston Street, Terang	50 year flood (stormwater)	flooding along Swanston Street, Shadforth Street and the adjacent Terang Railway Line has also flooded a house at 20 Swanston Street below floor.	Deploy road closure signs as needed.	Council
High Street, Terang	50 year flood (stormwater)	High Street is overtopped by floodwater near Strong Street. Flooding ponds on the south side of the street before becoming deep enough to flow east for a short distance and then through the central median gap to the north side of High Street.	Deploy road closure signs as needed.	Council
Wilson Street, Terang	50 year flood (stormwater)	A low section along the north end of the Wilson Street court is impacted by flooding. Overland flow overtops the curb and flows into the Railway Reserve and along the Terang Railway Line to Thomson Street.	Deploy road closure signs as needed.	Council
A building at 147 Peterborough Road, Terang.	100 year flood (stormwater)	A house at 4583 Hopetoun-Rainbow Road may be impacted above floor during a 100 year flood event.	Sandbag building as needed.	VICSES
Terang Golf Course, 6 Baynes Street, Terang.	100 year flood (stormwater)	Lower sections of the Terang Golf Course is impacted by flooding.	No action required.	VICSES
Terang Pony Club, Terang.	100 year flood (stormwater)	Lower sections of the Terang Pony Club is impacted by flooding.	No action required.	VICSES
Princes Highway, west of Terang.	100 year flood (stormwater)	Floodwater overtops the Princes Highway and impacts the area adjacent to the Bowles Club, Terang Caravan Park and the ?? School carpark.	Deploy road closure signs as needed.	Regional Roads Victoria

For more detailed information regarding buildings and roads impacted refer to the Terang Flood Intelligence Card below.

Table 14. Terang Flood Intelligence Card (Stormwater flooding)

Flood travel time	Time from start of rain to steep rise in floodwater 1.5 - 6 hours Riverine flooding duration: 1 day					
Rainfall Intensity Triggers (BOM)	**Annual Exceedance Probability (1 in year)**	**^Terang estimated damages (buildings over floor)**	**Consequence / Impact**	**Houses/ buildings flooded / isolated**	**Roads Impacted**	**Action**
~46 mm in 12 hour to ~58.7 mm in 24 hours	5					
~56 mm in 12 hour to ~71 mm in 24 hours	10		The capacity of most stormwater drains and culverts are exceeded in a 1 in 10 year flood event.			
~66 mm in 12 hour to ~84.4 mm in 24 hours	20					
~81 mm in 12 hour to ~104 mm in 24 hours	50				Roads that may be impacted by flooding; Cameron Street, Shadforth Street and Swanston Street.	Council clear debris from drains and culverts as needed. Council and Regional Roads Victoria deploy road closure signs as needed. VICSES sandbag buildings as needed.
~93.9 mm in 12 hour to ~121 mm in 24 hours	100	5 (4)	Several buildings are prone to flooding at the Terang Golf Club, the Terang Pony Club, 20 Swanston Street and 147 Peterborough Road. Stormwater flooding in Terang mostly impacts local minor and major roads.	4 buildings may be impacted by flooding; Terang Pony Club, sections of the Terang Golf Club course, 20 Swanston Street (below floor flooding) and 147 Peterborough Road (above floor flooding).	Roads that may be impacted by flooding; Cameron Street, Shadforth Street, Swanston Street, Peterborough Road, Hardy Street, Thompson Street, Strong Street, McKinnon Street, Seymour Street, Emeny Street, Bourkes Road, Princes Highway, High Street, Wilson Street, Baynes Street, Ewing Street, Grey Street, Littles Lane, Mary Bradshaw Ave, Cobden-Terang Road and Terang-Mortlake Road.	Council and Regional Roads Victoria deploy road closure signs as needed. VICSES sandbag buildings as needed.
54 mm fell on the 12th of February	2005	5 (1)	A building at 147 Peterborough Road was impacted by flooding above floor.	1 building was flooded above floor at 147 Peterborough Road.	Roads impacted by flooding; Peterborough Road and Cobden-Terang Road.	
93 mm fell on the 24th of January	January 1991	5	This flood event caused significant impacts to the local road network within Terang.			

^ Estimated property and building damages using historic flood events request for assistance and anecdotal information provided by the VICSES Terang Unit.

Appendix C4: Port Campbell Flood Emergency Plan

While Port Campbell is prone to riverine, stormwater and storm surge flooding, the flood risk is considered low. During historic flood events, the Port Campbell Holiday Park was regularly impacted by flooding from Port Campbell Creek. However following the construction of a 2 m high earthen levee on the western boundary of the Port Campbell Holiday Park, the caravan park is no longer impacted by regular flood events. It is possible that the levee could be overtopped during significantly flood events. Refer to the map below showing the location of the levee. Refer to the flood photos below of flooding along the Port Campbell Creek during the September 2016 flood event.

When there are heavy localised rainfall in Port Campbell local overland floodwater can build up on the eastern side of the Port Campbell Holiday Park levee. When this occurs the caravan park managers pump the stormwater back over the levee to alleviate the localised flooding. During the 2010 and 2011 flood events, the Port Campbell Holiday Park was impacted by stormwater flooding. A Wannon Water Sub-Station is located within the grounds of the Holiday Park. It is understood that this sub-station has been inundated during past high water events. Wannon Water has completed works to reduce flood risk to the sub-station.

Port Campbell Creek has a small Catchment area of approximately 83 km^2, refer to the map below. Rapid rises in floodwater can occur in the Port Campbell Creek at Port Campbell within 3 to 6 hours form rainfall. The floodwater peak may occur within 6 to 9 hours from rainfall. There are no local stream gauges that provide floor warning for Port Campbell.

Port Campbell has been impacted by several storm surge flood events. Although flood mitigation works have been undertaken to construct a sea wall to protect assets at risk of storm surge flooding, the last storm surge flood event caused significant damage to the Port Campbell Surf Lifesaving Club building. During the 2014 storm surge flood event the force of the waves and rocks damaged the window sills of the building, causing over floor flooding. Refer to the map below for the location of the sea wall, adjacent to the Port Campbell Surf Lifesaving Club.

Most years, the Campbells Creek Estuary forms a sand bar to the ocean during the summer months which then traps water behind it. River flows regularly break through the sand bar without the need for excavation.

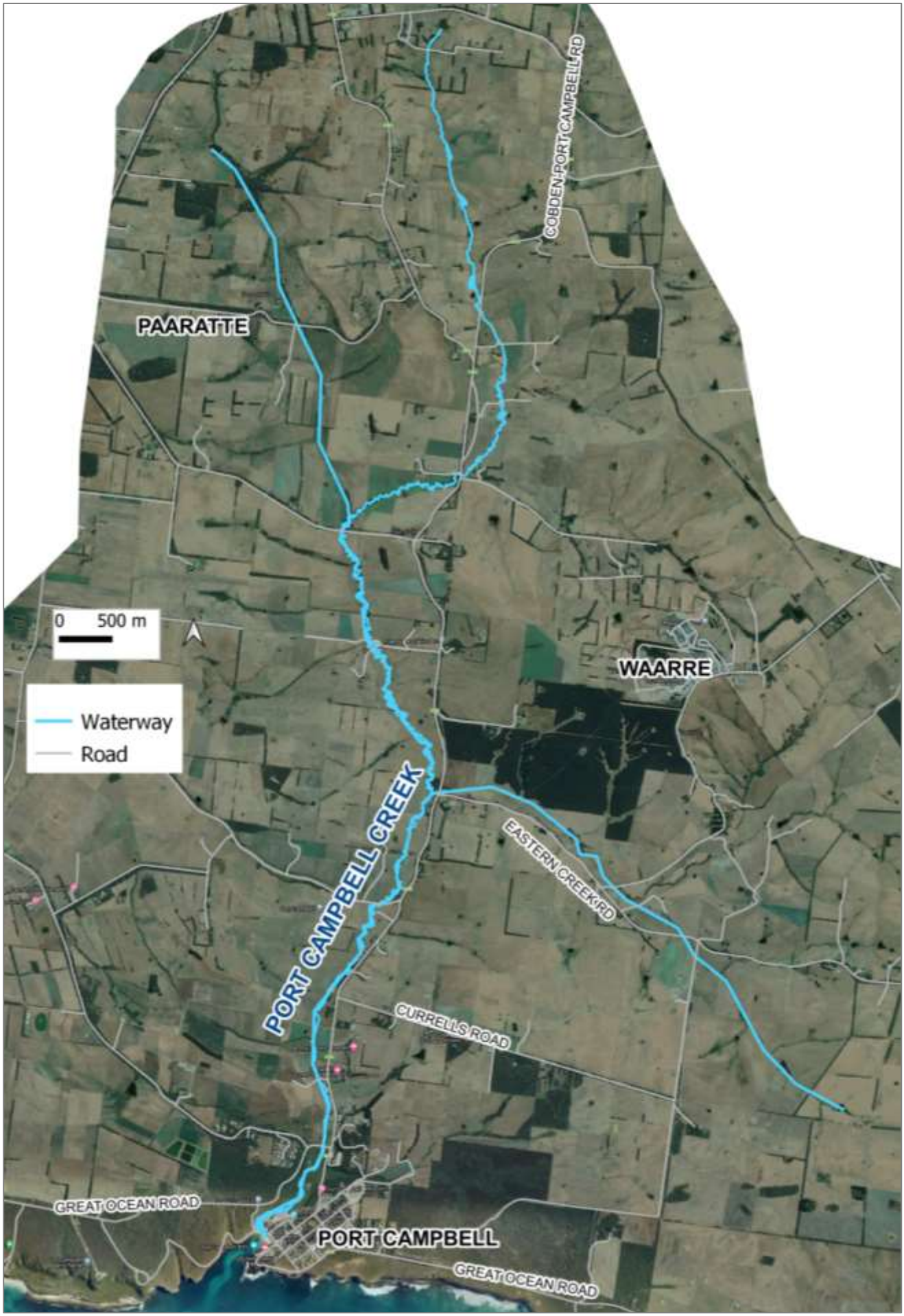


Figure 30. The Port Campbell Creek catchment area.

Figure 31. Assets at risk of flooding in Port Campbell.

Figure 32. Assets at risk of flooding in Port Campbell

Historic Flood Events

No stream gauge monitoring is available along the Port Campbell Creek. Given the close proximity of the Curdie River stream gauge at Curdie, this stream gauge was used to indicate when historic flood events have occurred in Port Campbell. Refer to the graph below. Port Campbell is likely to have experienced flooding events during 1978, 1984, 1986, 1991, 1992, 1996, 2004, 2010, 2011, 2016 and 2017.

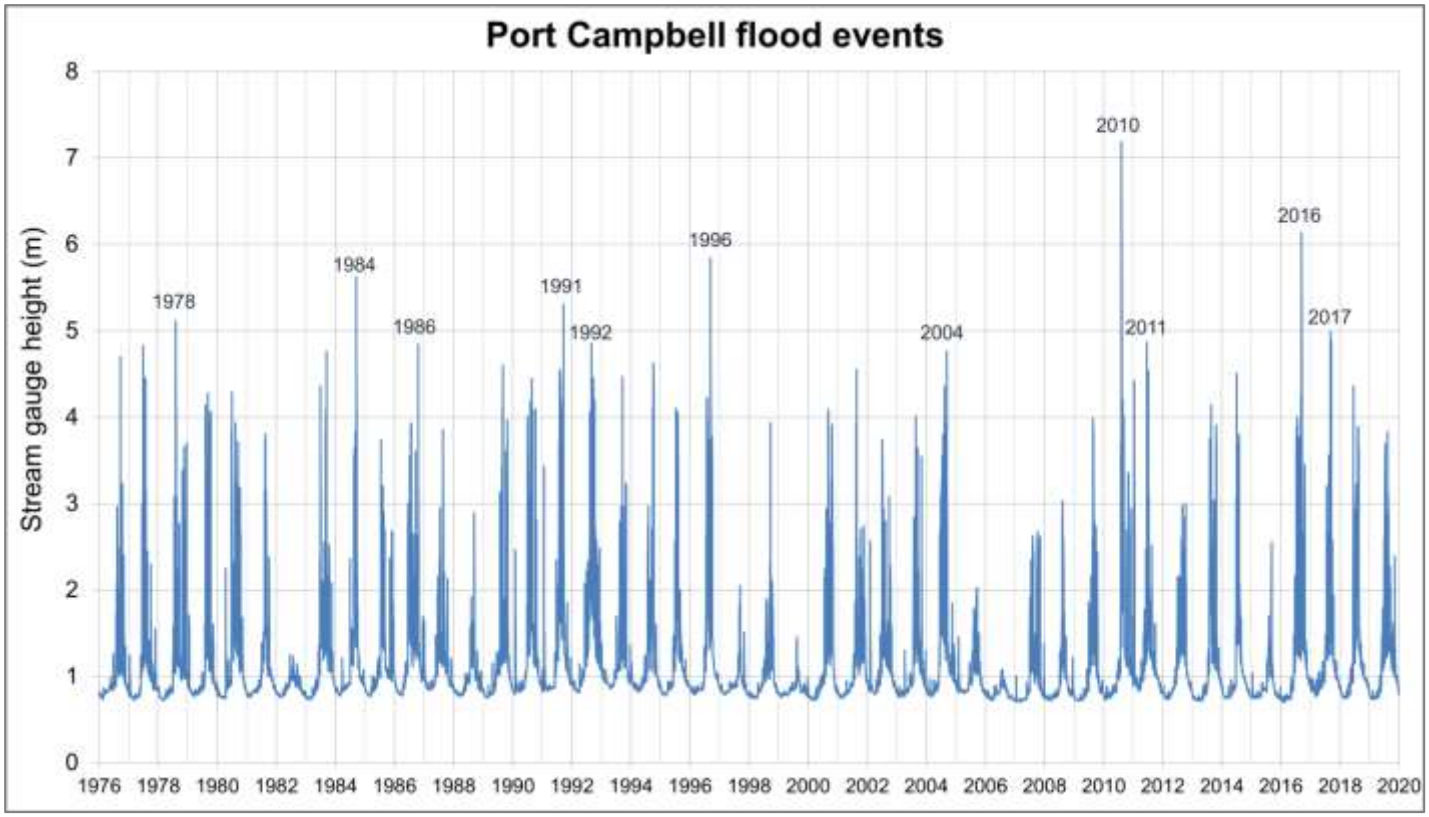


Figure 33. Curdie River at Curdie historic flood events.

Figure 34. Flooding in Port Campbell Creek during the September 2016 flood event.

Figure 35. Flooding along Port Campbell Creek impacting Cobden-Port Campbell Road during the September 2016 flood event.

Port Campbell Flood Impacts and Required Actions

Given that no flood study has been undertaken for riverine, stormwater or storm surge flooding in Port Campbell. Flood risk information provided below was sourced from historic flood information provided by the Port Campbell VISES Unit and the Corangamite Shire Council. Assets at risk of riverine flooding were estimated using the 1 in 100 year AEP flood extent developed by the Corangamite Shire Flood Study (DNRE 2000). It's important to note the information used to estimate assets at risk of flooding below has a low level of accuracy and should be used as a guide only.

For additional flood risk information refer to the Port Campbell Flood Intelligence Card, tables and maps below.

Table 15. Port Campbell key assets at risk of flooding.

Asset register				
Asset Name and location	**Annual Exceedance Probability (1 in year)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Port Campbell Holiday Park, 30 Morris Street, Port Campbell.	100 year flood (stormwater)	The Port Campbell Holiday Park may be impacted by minor stormwater flooding. Floodwater from localised rainfall and overland flow may build up on the western side of the levee	Pump the floodwater over the levee	Port Campbell Holiday Park Managers
Wannon Water Sub-Station, Port Campbell Holiday Park, Port Campbell.	100 year flood	Floodwater may impact the Wannon Water Sub-Station, during a 1 in 100 year flood event.	Sandbag as needed.	VICSES
Cobden-Port Campbell Road, 4.7 km north of Port Campbell.	100 year flood	Floodwater may overtop the Cobden-Port Campbell Road, 4.7 km north of Port Campbell.	Deploy road closure signs as needed.	Council
Port Campbell Surf Lifesaving Club, 1 Cairns Street, Port Campbell.	100 year flood (storm surge)	Storm surge flooding may flood the Port Campbell Surf Lifesaving Club building over floor.	Evacuate the building as needed.	Victoria Police

For more detailed information regarding buildings and roads impacted refer to the Port Campbell Flood Intelligence Card below.

Table 16. Port Campbell Flood Intelligence Card (riverine, storm surge and stormwater flooding)

Flood travel time	Time from start of rain to steep rise in floodwater 3 - 6 hours Time from start of rain to Port Campbell peak 6 - 9 hours Riverine flooding duration: 1 day

Rainfall Intensity Triggers (BOM)	Average Recurrence Interval (ARI)	^Port Campbell estimated damages (buildings over floor)	Consequence / Impact	Houses/ buildings flooded / isolated	Roads Impacted	Action
~46.8 mm in 12 hour to ~60 mm in 24 hours	5					
~56.2 mm in 12 hour to ~71.9 mm in 24 hours	10					
~66 mm in 12 hour to ~84.5 mm in 24 hours	20					
~80.5 mm in 12 hour to ~104 mm in 24 hours	50					VICSES activate ground observers to take photos and record flood levels at key locations. Council clear debris from drains and culvers as needed.
~92.5 mm in 12 hour to ~121 mm in 24 hours	100	5 (2)	The Port Campbell Holiday Park may be impacted by minor stormwater flooding. Floodwater from localised rainfall and overland flow may build up on the western side of the levee. Storm surge flooding may flood the Port Campbell Surf Lifesaving Club building over floor. Floodwater may impact the Wannon Water Sub-Station located at the Port Campbell Holiday Park.	2 buildings may be impacted by flooding; The Port Campbell Holiday Park (30 Morris Street) and the Port Campbell Surf Lifesaving Club (1 Cairns Street).	Access may be cut to; Cobden-Port Campbell Road, 4.7 km north of Port Campbell.	VICSES sandbag buildings and the Wannon Water Sub-station as needed. Council to deploy road closure signs as needed. Manager of the Caravan Park, pump water over the levee if impacted by stormwater.

^ Estimated property and road impacts using flood extent mapping from the Corangamite Shire Council Flood Study (DNRE 2000).

Appendix C5: Lake Corangamite Flood Emergency Plan

Lake Corangamite has experienced flooding during wet periods which has significantly impacted adjacent farmland and infrastructure. Lake Corangamite is located within the Lake Corangamite Basin, a landlocked system that includes the Woady Yaloak River, Pirron Yallock Creek and a number of small waterways feeding Lake Corangamite.

Lake Corangamite is listed as a Ramsar wetland that provides habitat for local and international rare and threatened flora and fauna. It is the largest permanent salt-water Lake in Australia. It is 234 km^2 in size and had a capacity of approximately 407,000 ML (GHD 2004). It takes a series of wet years to fill Lake Corangamite and for flooding to occur.

Lake Corangamite receives inflows from Pirron Yallock Creek to the south, and the Woady Yaloak River via Lake Martin. When Lake Martin is at full capacity, water backs up along the Woady Yaloak River flooding adjoining farmland and causing some inconvenience. Lake Corangamite also receives inflows from Gnarkeet Chain of Ponds and adjacent waterways. Lake Gnarpurt receives inflows from waterways to the north, Browns Waterholes and Haunted Gully.

A stream gauge on the Woady Yaloak River provides an indication of inflows into Lake Corangamite, and monitoring of the Lake Corangamite water level provides an indication of when historic flood events.

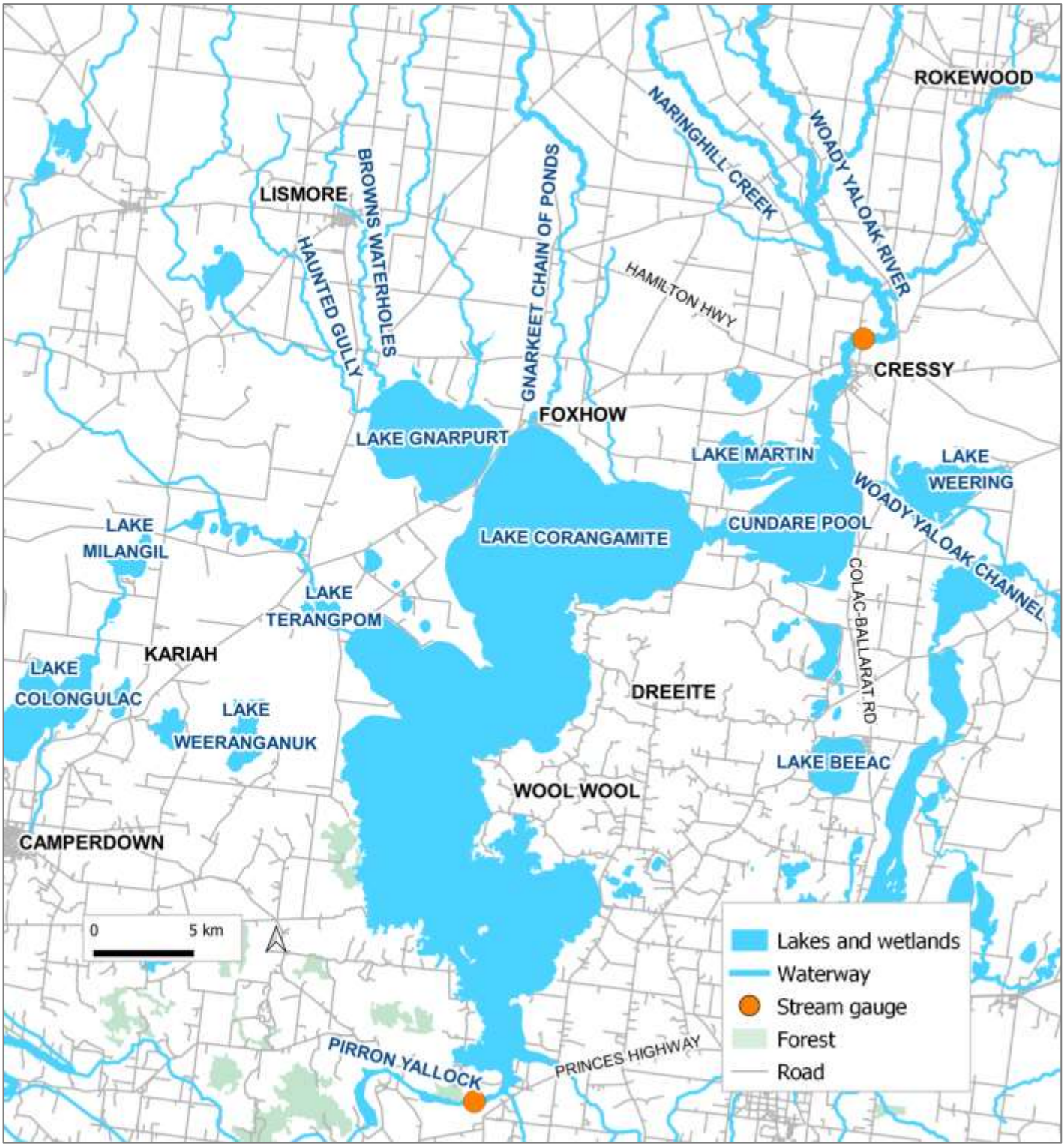


Figure 36. Lake Corangamite and surrounding waterways, lakes and wetlands.

Historic Flood Events

Lake Corangamite experienced a sequence of flood events from the 1950's until 1982. Since then there has been a sequence of dry years where the water level of Lake Corangamite has continually fallen. Refer to the graph below. The most significant flood events on record occurred in 1950s, causing extensive damage and loss of income to surrounding farmland and local infrastructure. Refer to flood photos below.

In 1966, the Lake Corangamite Act (1966) was passed which enabled local landholders to surrender land adjacent to the lake and below 118.06m AHD, in return for compensation. The surrendering of land was optional at the time, and approximately 1,508 ha up to 118.06 mAHD of land was transferred to the Crown (GHD 2004). This significantly reduced the impact of flooding to adjacent farmland.

A flood extent from the 1956 flood event has been defined as the 1 in 100 year AEP flood extent, Corangamite Lake level of 118.12 m AHD at Foxhow. Refer to the flood extent map below.

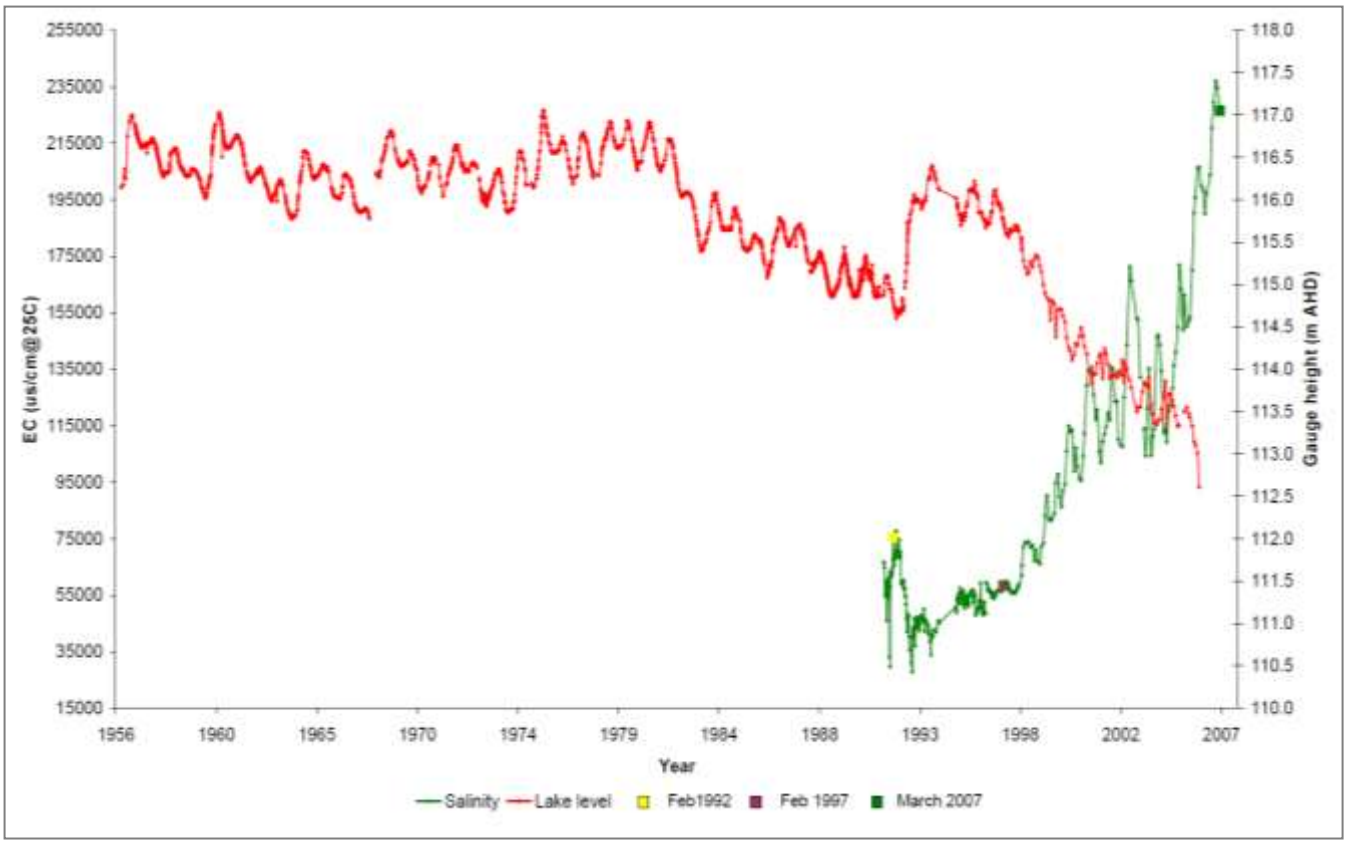


Figure 37. Lake Corangamite historic flood events (EPA 2010).

Figure 38. Flooding at Lake Corangamite near Wool Wool during 1956 (Corangamite CMA).

Figure 39. Flooding at Lake Corangamite near Pirron Yaloak during 1958 (Corangamite CMA).

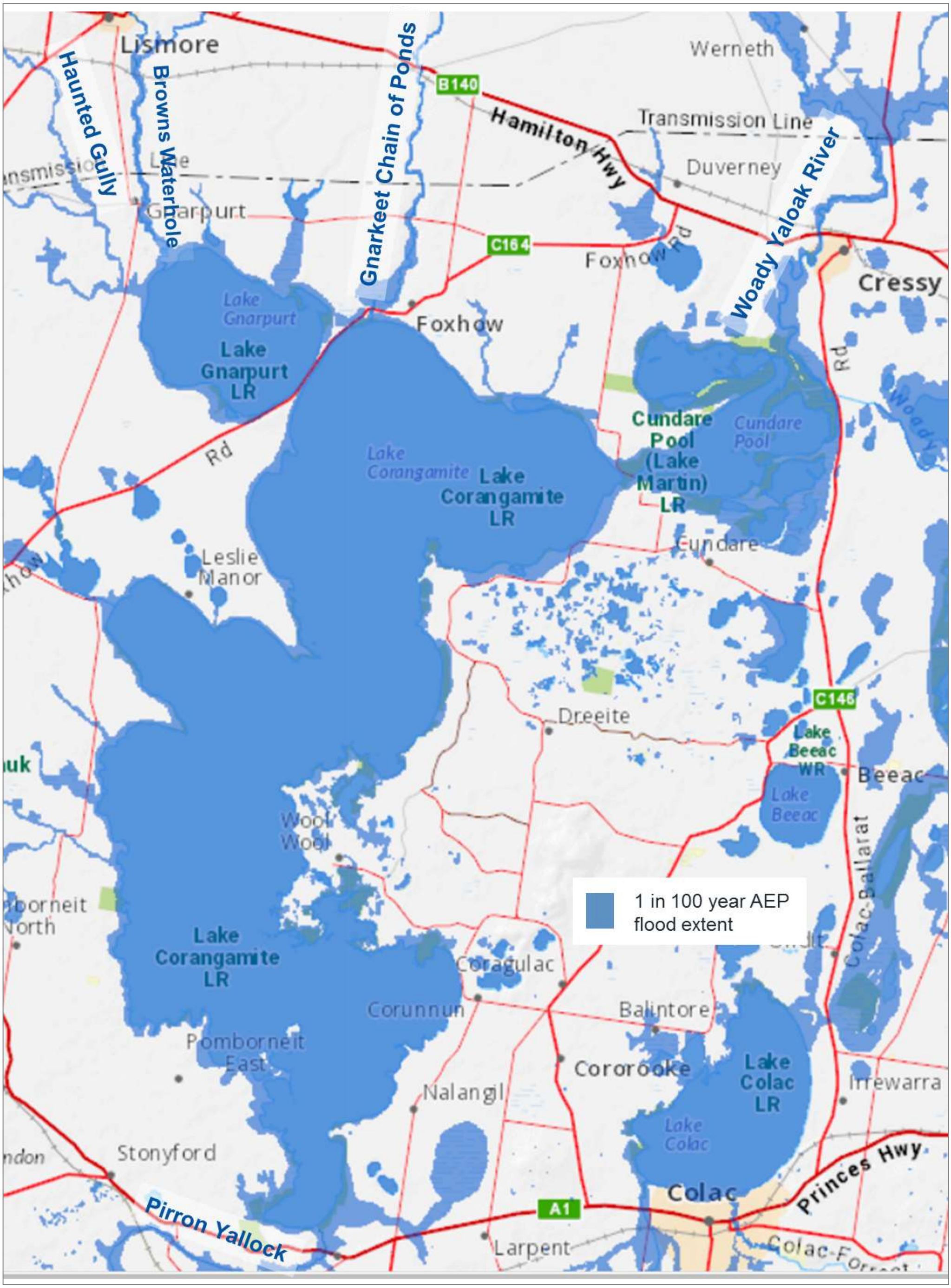


Figure 40. Flooding at Lake Corangamite during 1956 flood event, 1 in 100 year AEP flood extent (DNRE 2000).

Flood Behaviour

Due to the flatness of the landscape, small lakes and wetlands surrounding Lake Corangamite fill and spill into adjacent depressions, generally towards Lake Corangamite creating wide flow paths. These surrounding lakes include Lake Martin, Cundare Pool, Lake Bookar, Lake Colongulac, Lake Cundare, Lake Gnarput, Lake Weering, Lake Terangpom and Lake Milangil. During prolonged wet periods, when Lake Corangamite floods it also spills into adjacent lakes, joining with surrounding lakes. These lakes are a mixture of fresh and saline systems. Lake Corangamite has no natural outlets. Water is mainly lost by evaporation or seepage.

Given the capacity of Lake Corangamite is 407,000 ML and the annual inflow from the Woady Yaloak River and Pirron Yallock Creek can be up to 60,000 ML/d, it takes several years of above average inflows to fill the Lake. Refer to graph below for the Lake Corangamite inflows measured at the Woady Yaloak River and Pirron Yallock Creek stream gauges.

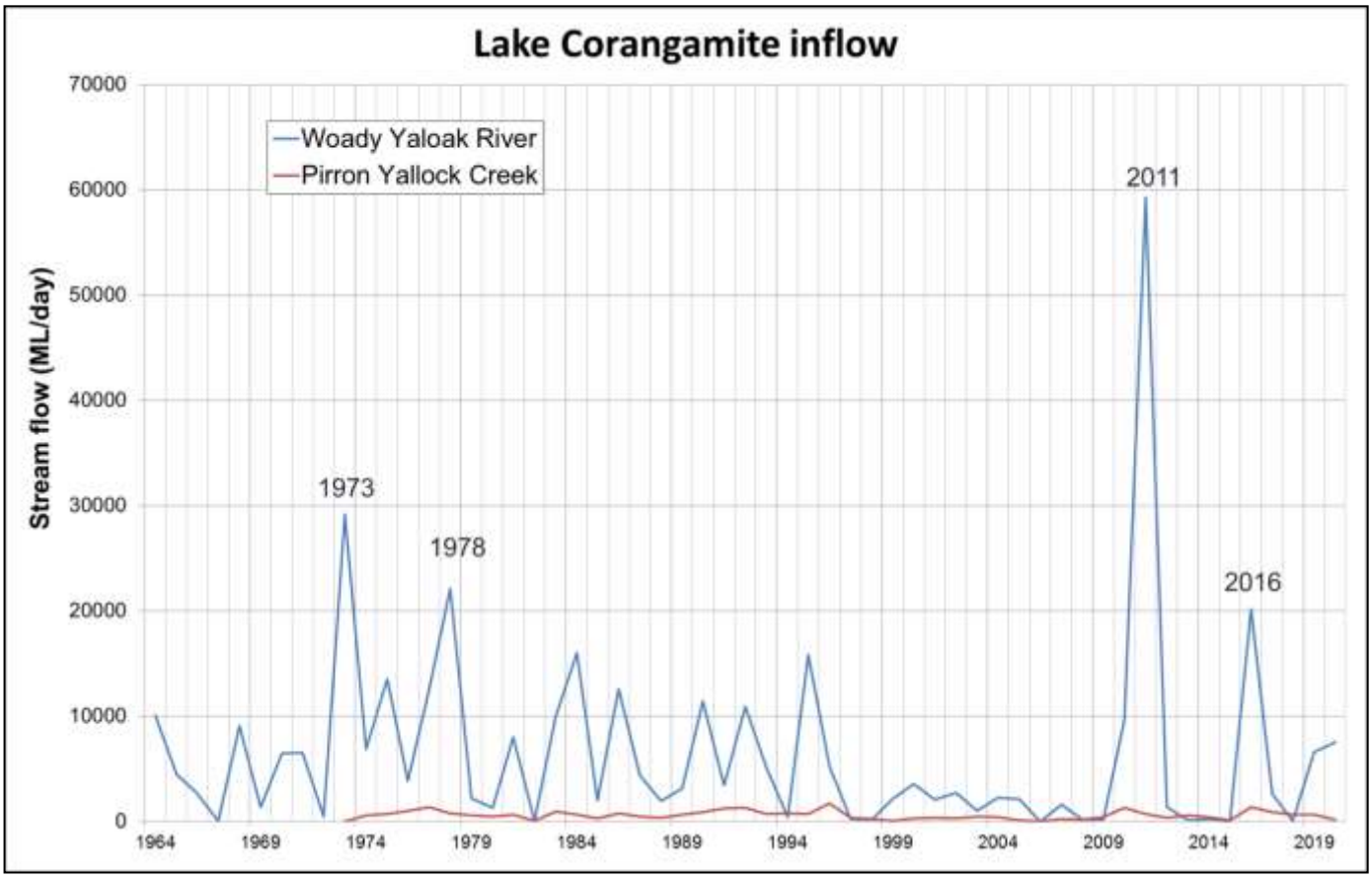


Figure 41. Lake Corangamite inflow from Pirron Yallock Creek and the Woady Yaloak River.

Influence of the Woady Yaloak Diversion Scheme

In the wet decade of the 1950s Lake Corangamite flooded and became connected via a series of wetlands and overflowed into the Barwon River. In response to the flooding in the 1950's a Diversion Scheme was constructed to divert flows from the Woady Yaloak River near Cressy into the Barwon River via the Woady Yaloak Diversion Channel. The Woady Yaloak Diversion Scheme was completed in 1956, to protect farmland surrounding the Lake Corangamite from floods.

Given the Woady Yaloak Diversion Channel has the capacity to divert 490 ML/d from Lake Corangamite, the capacity to divert flows are minor compared to the peak flood inflows from the Woady Yaloak River can be up to 60,000 ML/d and the capacity of Lake Corangamite is approximately 407,000 ML. The Woady Yaloak Diversion Channel doesn't have sufficient capacity to prevent flooding for occurring in Lake Corangamite. However over a long period the Woady Yaloak Diversion Channel is able to alleviate the severity of flooding.

The Woady Yaloak Diversion Channel has not been fully operational since the late 1990's and has only be operated for a few short periods since then (GHD 2004).

Lake Corangamite Flood Impacts and Required Actions

The 1956 flood event has been defined as the 1 in 100 year AEP flood extent, Corangamite Lake level of 118.12m AHD at Foxhow. This 1 in 100 year flood extent was developed as part of the Corangamite Shire Council Flood Study (DNRE 2000) and has been used to assess flood risk. It's important to note this information used to estimate assets at risk of flooding below has a low level of accuracy and should be used as a guide only.

For additional flood risk information refer to the Lake Corangamite Flood Intelligence Card, tables and maps below.

Key assets at risk of flooding at Lake Corangamite and surrounding lakes and waterways are listed in the table below.

Table 17. Lake Corangamite key assets at risk of flooding.

Asset register				
Asset Name and location	**Annual Exceedance Probability (1 in year)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Princes Highway, south of Lake Corangamite, adjacent to Pirron Yallock.	100 year flood	Floodwater may overtop the Princes Highway, south of Lake Corangamite, adjacent to Pirron Yallock during a 100 year flood event.	Deploy road closure signs as needed.	Regional Roads Victoria
Colac-Ballarat Road, north of Cressy.	100 year flood	Floodwater from the Woady Yaloak River may overtop the Colac-Ballarat Road during a 100 year flood event.	Deploy road closure signs as needed.	Council
Camperdown-Lismore Road, south of Lismore.	100 year flood	Floodwater may overtop the Camperdown-Lismore Road, south of Lismore during a 100 year flood event.	Deploy road closure signs as needed.	Council
Foxhow Road, between Cressy and Camperdown.	100 year flood	Floodwater may overtop Foxhow Road, between Cressy and Camperdown during a 100 year flood event.	Deploy road closure signs as needed.	Council

For more detailed information regarding buildings and roads impacted refer to the Lake Corangamite Flood Intelligence Card below.

Table 18. Lake Corangamite Flood Intelligence Card

Flood travel time				A sequence of wet years.	
Rainfall	**Annual Exceedance Probability (1 in year)**	**^Lake Corangamite estimated property damages (buildings over floor)**	**Consequence / Impact**	**Roads Impacted**	**Action**
A sequence of wet years	100	28 (0)	Lake Corangamite and adjacent lakes and waterway experience flooding following a sequence of wet years. Flooding of Lake Corangamite has caused significant impacts to adjacent farmland, roads and other infrastructure.	Roads that may be impacted by flooding include; Foxhow Road, Colac-Ballarat Road Princes Highway Camperdown-Lismore Road Corangamite Lake Road Wool Wool Road Pomborneit-Foxhow Road Hill Road Leslie Manor Road Lower Darlington Road Cundare-Duverney Road	Council and Regional Roads Victoria deploy road closure signs as needed.

^ Estimated property and road impacts using flood extent mapping from the Corangamite Shire Council Flood Study (DNRE 2000).

Appendix C6: Gellibrand River Flood Emergency Plan

Princetown has experienced extensive and frequent riverine flooding from the Gellibrand River. The upper reaches of the Gellibrand River drains the western mountain range of the Otway National Park, and flows west through Gellibrand, Carlisle and Princetown. While the upper section of the Gellibrand River catchment area is located outside of the Corangamite Shire Council, the Gellibrand River forms the eastern boundary of the Corangamite Shire Council from Kennedys Creek. The catchment area of the Gellibrand River is approximately 1,295 km^2.

The Gellibrand River receives inflows from the Kennedy Creek upstream of the Deans Road stream gauge. The Gellibrand River also receives inflows from several minor waterways, these include: Carlisle River, Love Creek, Boggy Creek, Charleys Creek, Latrobe Creek, Chapple Creek, Arkins Creek, Leahy Creek, Sandy Creek, Skinner Creek and Bryant Creek. Refer to the map below.

Flooding along the Gellibrand River causes significant impacts to farmland and cuts access to roads along the lower Gellibrand River. Flooding impacts sections of the Great Ocean Road and cuts access to the Princetown Recreation Reserve Caravan Park.

There are six stream gauges within the Gellibrand River catchment that provide early flood warning, refer to the map below. These include the Gellibrand, Carlisle, Deans Road, Kennedys Creek and Princetown gauges. Rises in stream flow at the Princetown gauge can occur between 2 to 2.5 days after rainfall in the upper catchment.

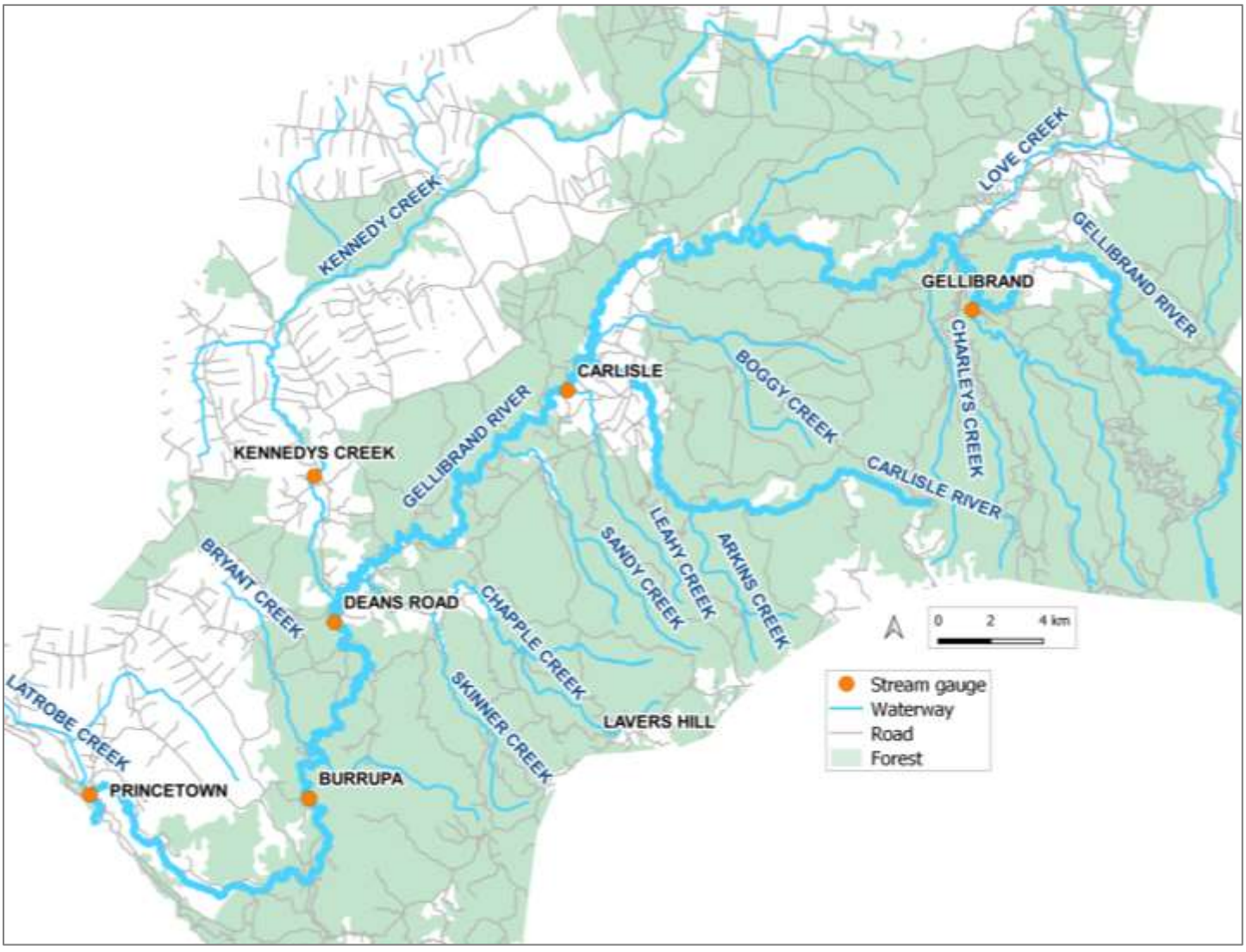


Figure 42. Gellibrand River catchment waterways.

Historic Flood Events

Flooding was recorded along the Gellibrand River has experienced frequent and extensive flood events, refer to the graph below. Significant flood events have occurred in 1971, 1975, 1978, 1980, 1984, 1986, 1991, 1996, 2010 and 2016.

The August 2010 flood was the largest in recent flood event. Stream gauges along the Gellibrand River at Burrupa was used to indicate historic flood events. Refer to the map above for the location of this stream gauge.

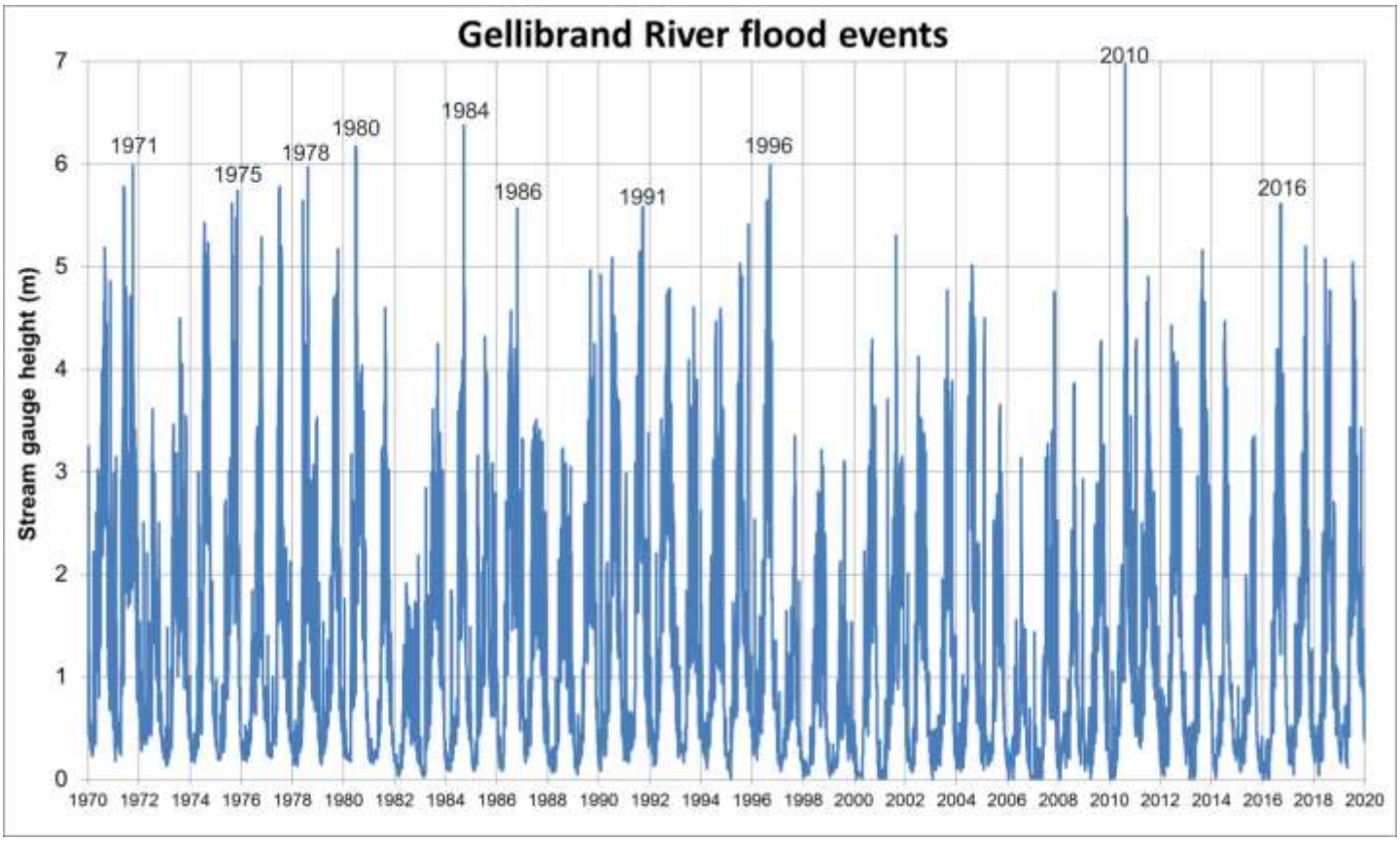


Figure 43. Gellibrand River historic flood events.

Rainfall records show that 135.4 mm of rainfall was recorded over two days during the August 2010 flood event with 81 mm falling on the 11th of August.

The August 2010 flood event caused significant impacts to farmland and cut access to the Old Coach Road, isolating the Princetown Recreation Reserve Caravan Park. Shallow flooding from the Gellibrand River also overtopped the Great Ocean Road Bridge, west of Princetown. Refer to the flood risk maps and the Gellibrand Flood Intelligence Card below.

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Figure 44. Flooding along the upper Curdies River at Bullaharre Road, near Cobden during the September 2016 flood event.

Gellibrand River Flood Behaviour

There are six stream gauges within the Gellibrand River catchment that provide early flood warning, these include the Gellibrand, Carlisle, Deans Road, Kennedys Creek and Princetown gauges. Rises in stream flow at the Princetown gauge can occur between 2 to 2.5 days after rainfall in the upper catchment. Refer to the graph below.

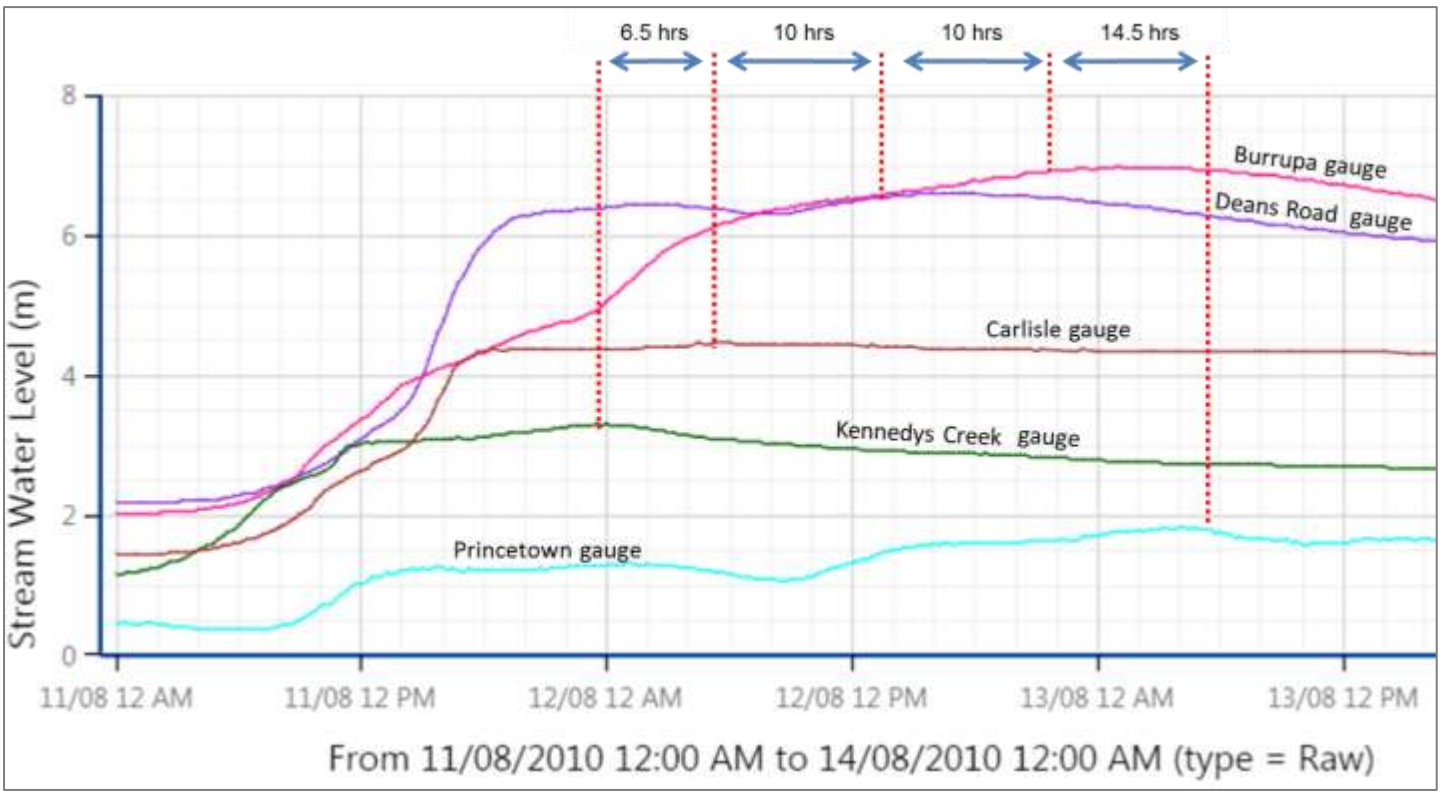


Figure 45. Gellibrand River and Kennedys Creek flows during the August 2010 flood event (Floodzoom).

Gellibrand River Estuary Impacts

The Gellibrand River Estuary is predominantly shaped by the prevailing south westerly ocean swell causing infilling and is classified as a wave dominated estuary. The rocky headland to the west of the estuary combined with easterly currents, common in summer months, promotes the accumulation of sand at the estuary entrance forming sandbars.

The interaction of riverine flooding and coastal processes are important considerations in determining the overall flood risk in along the lower Gellibrand River. The influence of these two factors on flooding varies with condition of the entrance, tides, swell, storm surges, the height of the sandbar and river flow. When flooding occurs in the Gellibrand River when the estuary mouth in closed, this significantly increases flood levels in the lower Gellibrand River. The height of the sandbar strongly influences the flood levels in lower Gellibrand River, the higher the sandbar the higher the flood levels. Refer to the photos below of the Gellibrand River Estuary open and closed.

Figure 46. Gellibrand River Estuary, sandbar blocking the Estuary mouth 9th March 2020 (Estuary Watch).

Figure 47. Gellibrand River Estuary, Estuary mouth open, 11th November 2019 (Estuary Watch).

Gellibrand River Flood Impacts and Required Actions

Given that no flood study has been undertaken for the Gellibrand River, flood risk information provided below was sourced from historic flooding information provided by the Port Campbell VICSES Unit and the Corangamite Shire Council. Assets at risk of flooding were estimated using the Corangamite Shire Flood Study (DNRE 2000), in additional anecdotal information. It's important to note the information used to estimate assets at risk of flooding below has a low level of accuracy and should be used as a guide only.

For additional flood risk information refer to the Gellibrand River Flood Intelligence Card, tables and maps below.

Key assets at risk of flooding along Gellibrand River are listed in the table below.

Table 19. Gellibrand River key assets at risk of flooding.

Asset register - Flooding Hotspots				
Asset Name and location	**Annual Exceedance Probability (1 in year)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Great Ocean Road Bridge, west of Princetown.	100 year flood	Shallow flooding from the Gellibrand River impacts the Great Ocean Road Bridge, west of Princetown during a 100 year flood event.	Deploy road closure signs and undertake traffic management as needed.	Regional Roads Victoria
The Princetown Recreation Reserve Caravan Park along the Old Coach Road.	100 year flood	The Princetown Recreation Reserve Caravan Park along the Old Coach Road.	Evacuate the Caravan Park as needed.	Victoria Police

For more detailed information regarding buildings and roads impacted refer to the Gellibrand River Flood Intelligence Card and flood damages/impact maps below.

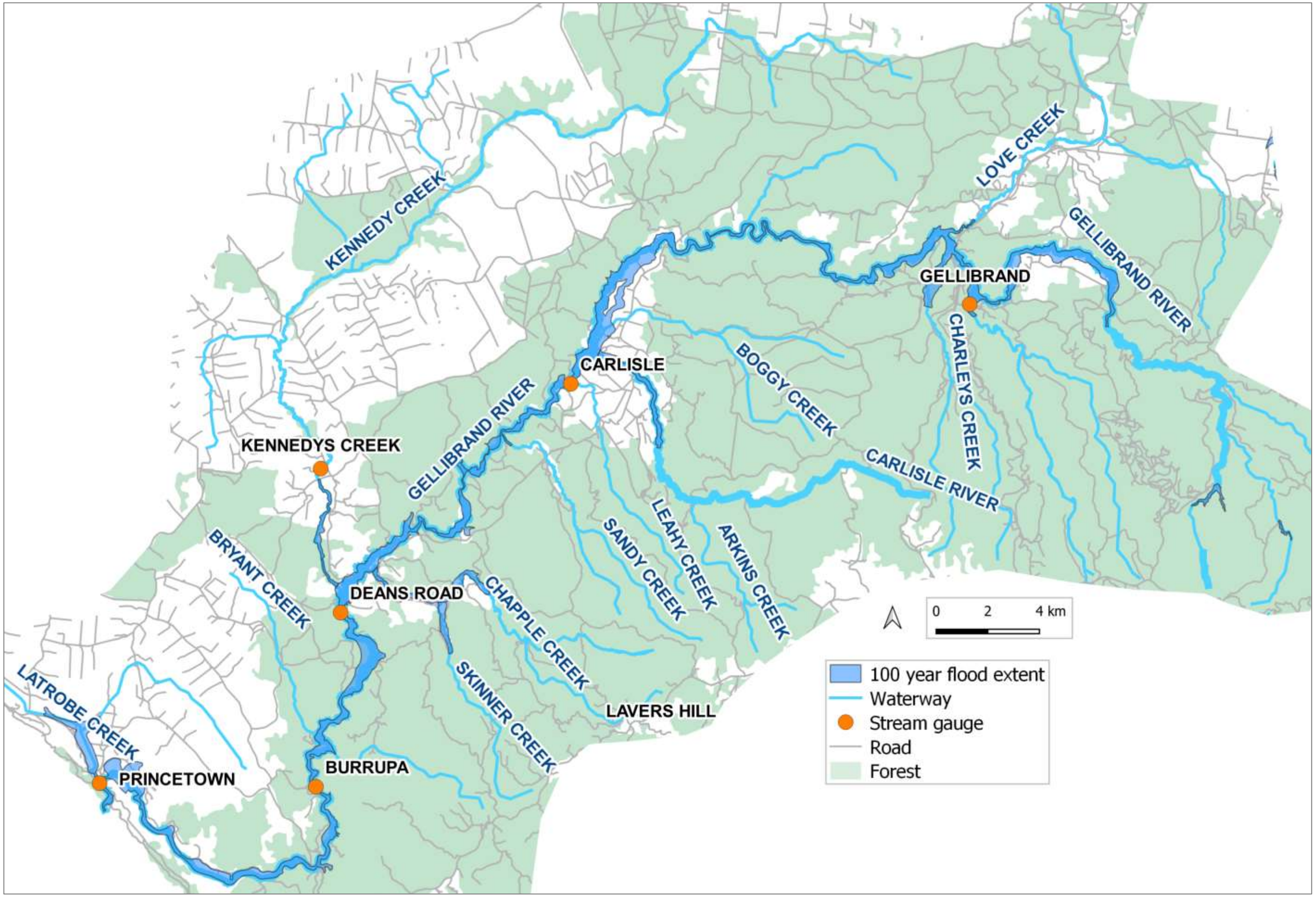


Figure 48. Gellibrand River 1 in 100 year AEP flood extent (DNRE 2000).

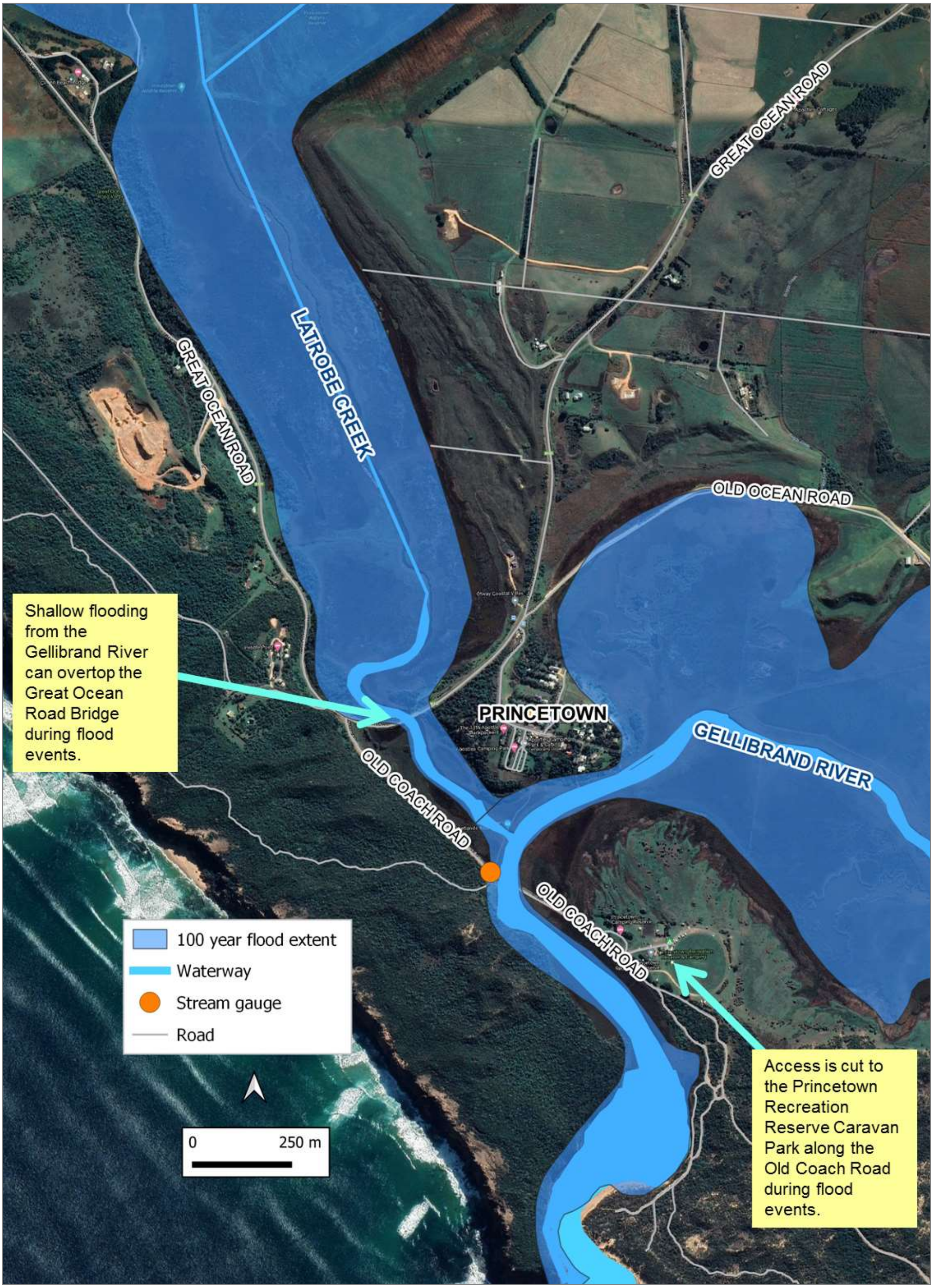


Figure 49. Gellibrand River at Princetown 1 in 100 year AEP flood extent (DNRE 2000).

Table 20. Gellibrand River Flood Intelligence Card

Flood travel time	Time from start of rain to steep rise in floodwater 10 - 14 hours Time from start of rain to Princetown peak 2 to 2.5 days Riverine flooding duration: 1-2 days

Kennedys Creek at Kennedys Creek gauge height 235211 (m)	Gellibrand River at Carlisle gauge height 235225 (m)	Gellibrand River at Deans Road gauge height 235258 (m)	Gellibrand River at Burrupa gauge height 235224 (m)	Gellibrand River at Princetown gauge height 235269 (m)	Annual Exceedance Probability (1 in year)	^Princetown and Gellibrand River Catchment estimated damages	Consequence / Impact	Houses/ buildings flooded / isolated	Roads Impacted	Action
					5					
					10					
					20					
					50					
3.3	4.47	6.59	6.96	1.81	100	?	Flooding may cut access to the Old Coach Road, isolating the Princetown Recreation Reserve Caravan Park. Shallow flooding along the Gellibrand River may overtop the great Ocean Road Bridge. Access is not likely to be cut to the Great Ocean Road.	The Princetown Recreation Reserve Caravan Park is isolated by flooding cutting access to the Old Coach Road.	Access is cut to the Old Coach Road.	VICSES activate ground observers to take photos and record flood levels at key locations. Council clear debris from drains and culvers as needed. Victoria Police evacuate the Princetown Recreation Reserve Caravan Park as needed. Regional Roads Victoria deploy road closure signs along the Great Ocean Road as needed.
3.3	4.47	6.59	6.96	1.81	August 2010	?	Flooding may cut access to the Old Coach Road, isolating the Princetown Recreation Reserve Caravan Park. Shallow flooding along the Gellibrand River may overtop the great Ocean Road Bridge. Access is not likely to be cut to the Great Ocean Road.	The Princetown Recreation Reserve Caravan Park is isolated by flooding cutting access to the Old Coach Road.	Access is cut to the Old Coach Road.	VICSES activate ground observers to take photos and record flood levels at key locations. Council clear debris from drains and culvers as needed. Victoria Police evacuate the Princetown Recreation Reserve Caravan Park as needed. Regional Roads Victoria deploy road closure signs along the Great Ocean Road as needed.

^ Estimated property and road impacts using the 1 in 100 year AEP flood extent mapping (DNRE 2000)

Appendix C7: Curdies River Flood Emergency Plan

The Curdies River forms the south western boundary of the Corangamite Shire. The upper reaches of the Curdies River catchment is located south of Lake Purrumbete, and flows south through Curdievale and Peterborough to the ocean. Scotts Creek is the main tributary of the Curdies River that contributes flows to the Curdies River upstream of the Curdies River stream gauge, north of Timboon. The catchment area of the Curdies River is approximately 1,063 km^2. Other minor waterways that also contribute flows to the Curdies River include Cobden Creek, Burnip Creek, Bostock Creek, Cooriemngle Creek, Ross Creek and Sunday Creek.

Flooding regularly occurs in the Curdies River Catchment significantly impacting buildings, farmland, minor and major roads and other infrastructure. Localised flooding is likely to occur in the area around Lake Purrumbete impacting the Lake Purrumbete Holiday Park and cutting access to local roads.

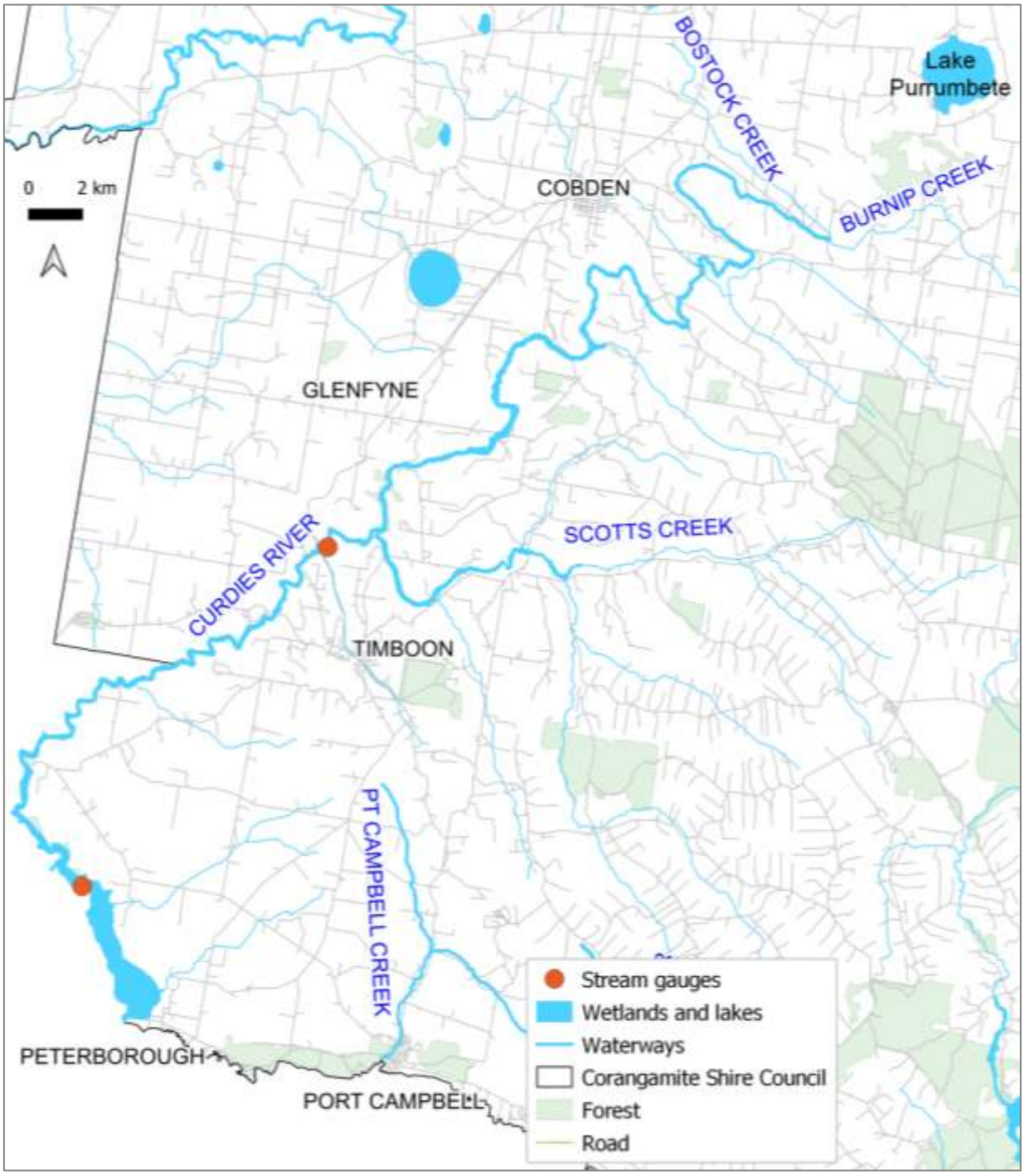


Figure 50. Curdies River catchment waterways.

Historic Flood Events

Flooding was recorded along the Curdies River has experienced frequent and extensive flood events, refer to the graph below. Significant flood events have occurred in 1929, 1966, 1974, 1975, 1977, 1978, 1984, 1991, 1992, 1996, 2004, 2010 and 2011. Refer to flood photos below

The August 2010 flood was by far the largest in recent flood event. Stream gauges along the Curdies River at Curdie and Peterborough were used to indicate historic flood events. Refer to the map above for the location of these stream gauges. For more details refer to the Curdies River Flood Intelligence Card below.

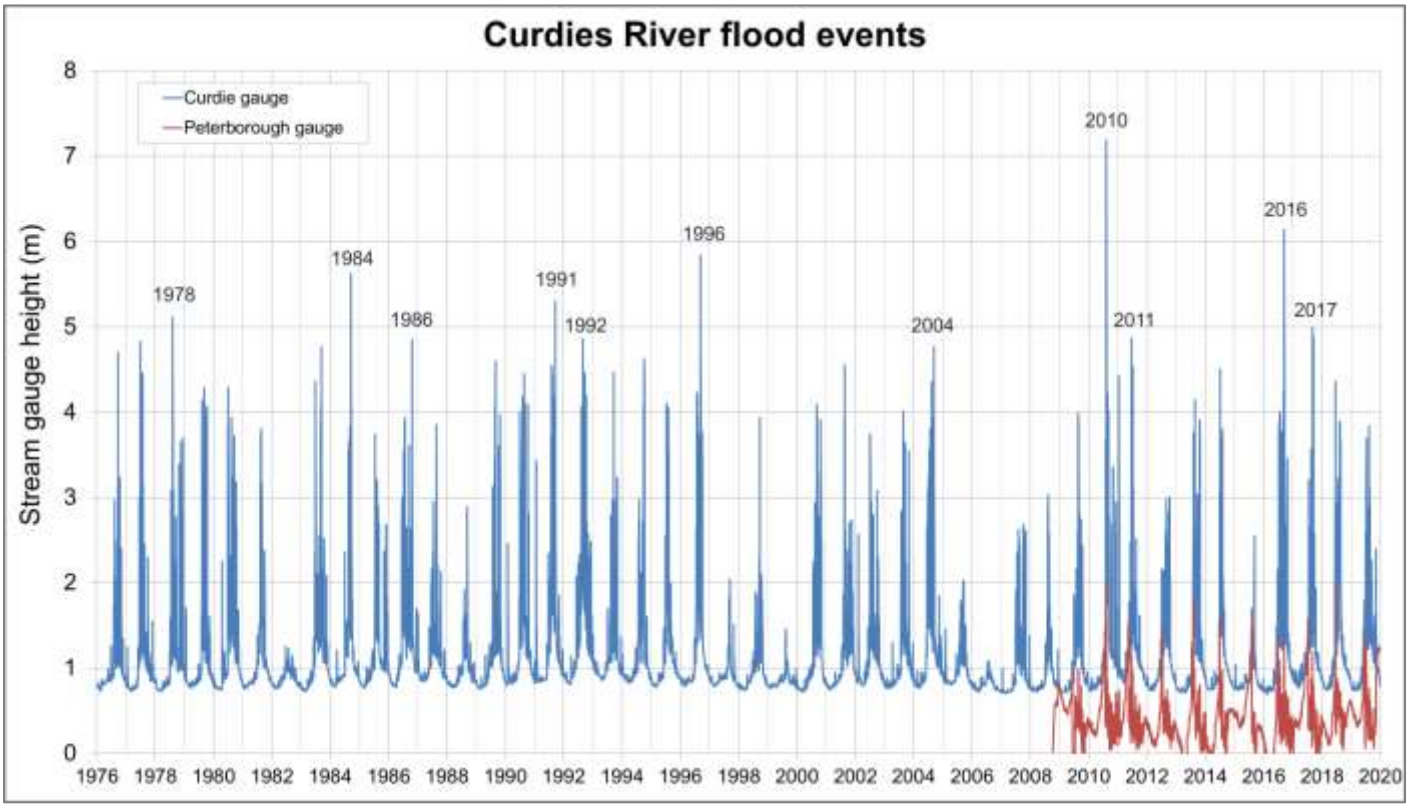


Figure 51. Curdies River historic flood events.

Figure 52. Flooding along the upper Curdies River during the January 2011 event.

Figure 53. Flooding along the upper Curdies River adjacent to the railway bridge during the September 2016 flood event.

Figure 54. Flooding along the upper Curdies River near Timboon during the September 2016 flood event.

Figure 55. Flooding along the upper Curdies River at Bullaharre Road, near Cobden during the September 2016 flood event.

Figure 56. Flooding along Scotts Creek cuts access to Rowes Road during the September 2016 flood event.

Flood Behaviour

Historic rainfall data shows that the Scotts Creek sub catchment contributes the majority of stream flow during flood events. Refer to the map below showing steam gauge and sub catchment areas within the Curdies River Catchment.

Flooding in the lower Curdies River is exacerbated by the formation of a sandbar at the Curdies River Estuary which blocks the flow of the Curdies River. The height of the sandbar strongly influences the flood levels in the lower Curdies River, the higher the sandbar the higher the flood levels.

Figure 57. Curdies River Estuary, a sandbar is blocking the Estuary mouth.

Figure 58. During the August 2010 flood event, peak river flows naturally cut through the sandbar (source: CCMA).

Figure 59. Curdies Estuary Inlet mouth closed, December 2018.

Flood Peak Travel Times

In addition the Curdie River stream gauges at Curdie and Peterborough, there is a gauge board located at the Peterborough Bridge, refer to the photo and maps below.

Figure 60. Curdies Inlet gauge board on the Peterborough Bridge.

Although each flooding event is different, closely monitoring the Curdie and Peterborough stream gauge levels in the upper Curdies River can provide several days of warning time. The time from a heavy rainfall event in the upper catchment to potential impacts in the low Curdies River can be three days. The graph below provides an example of flood peak travel time for a significant flood event, with approximately 140 mm of rainfall over 4 hours in the upper catchment;

- Time from the start of rain to steep rise in floodwater at the Curdie gauge 4 to 6 hours.
- Time between start of steep rise and peak at the Curdie gauge 2.5 days.
- Time between Curdie gauge and Peterborough gauge peak 10 hours.
- Time between Peterborough gauge and the Peterborough Inlet gauge board peak 9 hours.

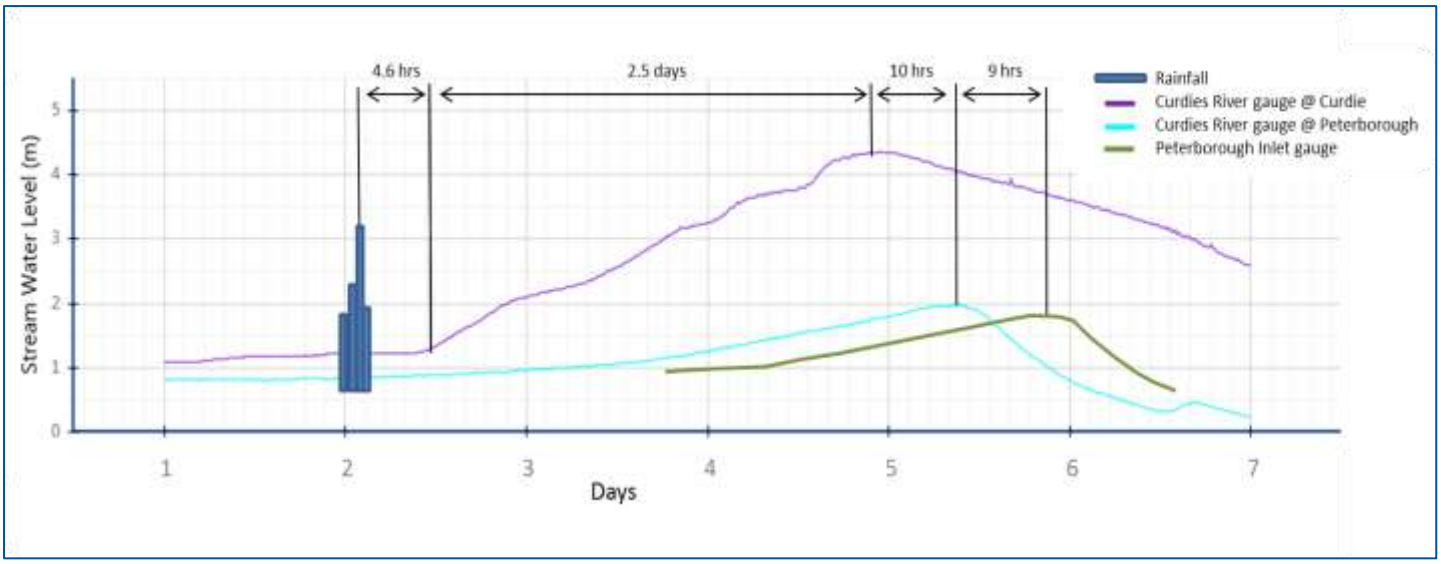


Figure 61. Curdies River flood peak travel times for a range of flood events (Corangamite CMA).

Table 21. Curdies River flood peak travel times for a range of flood events (Corangamite CMA).

Date/time	Curdie gauge height (m)	Date/time	Peterborough Inlet gauge board height (m AHD)	Time difference (hours)
11/08/2010 21:00	7.19	12/08/2010 5:00	2	8
14/09/2016 17:00	6.14	15/09/2016 5:00	1.32	12
17/06/2018 23:00	4.36	18/06/2018 8:00	1.97	9
04/08/2013 11:00	2.65	4/08/2013 18:00	1.78	7

Factors that influence flood peak travel times include;

- Starting water level of the inlet
- Height of the sandbar
- Peak flow volume
- Wetness of the catchment

The correlation of the flood peak travel times is poor due to the influence of the sandbar height. The height of the sandbar is the dominant factor that influences the flood peak travel times in the lower Curdies River.

Curdies River Flood Impacts and Required Actions

Given that no flood study has been undertaken for the Curdies River, flood risk information provided below was sourced from historic flooding information provided by the Port Campbell VICSES Unit and the Corangamite Shire Council. Assets at risk of flooding were estimated using the Corangamite Shire Flood Study (DNRE 2000), in additional anecdotal information. It's important to note the information used to estimate assets at risk of flooding below has a low level of accuracy and should be used as a guide only.

For additional flood risk information refer to the Curdies River Flood Intelligence Card, tables and maps below.

Key assets at risk of flooding along Curdies River are listed in the table below.

Table 22. Curdies River key assets at risk of flooding.

Asset register - Flooding Hotspots				
Asset Name and location	**Annual Exceedance Probability (1 in year)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Several cabins at the Lake Purrumbete Holiday Park (540 Purrumbete Estate Road).	100 year flood	Several cabins at the Lake Purrumbete Holiday Park may be impacted by flooding during a 100 year flood event.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police
Purrumbete Estate Road, adjacent to the Purrumbete Holiday Park.	100 year flood	The Purrumbete Estate Road may be impacted by flooding during a 100 year flood event.	Deploy road closure signs as needed.	Council
Cobden – Port Campbell Road, adjacent to the Curdies River.	100 year flood	Flooding from the Curdies River map impact the Cobden – Port Campbell Road during a 100 year flood event.	Deploy road closure signs as needed.	Council
Lavers Hill-Cobden Road, adjacent to the Curdies River.	100 year flood	Flooding from the Curdies River map impact the Lavers Hill-Cobden Road during a 100 year flood event.	Deploy road closure signs as needed.	Council
Timboon-Peterborough Road, adjacent to the Curdies River.	100 year flood	Flooding from the Curdies River map impact the Timboon-Peterborough Road during a 100 year flood event.	Deploy road closure signs as needed.	Council
Farmland and roads east of the lower Curdies River.	100 year flood	When a sandbar forms at the Curdies River Estuary has formed to block outflow of the lower Curdies River, this will increase the area impacted by flooding to adjacent farmland and roads.	Notify farmers adjacent to the lower Curdies River	VICSES

For more detailed information regarding buildings and roads impacted refer to the Curdies River Flood Intelligence Card and flood damages/impact maps below.

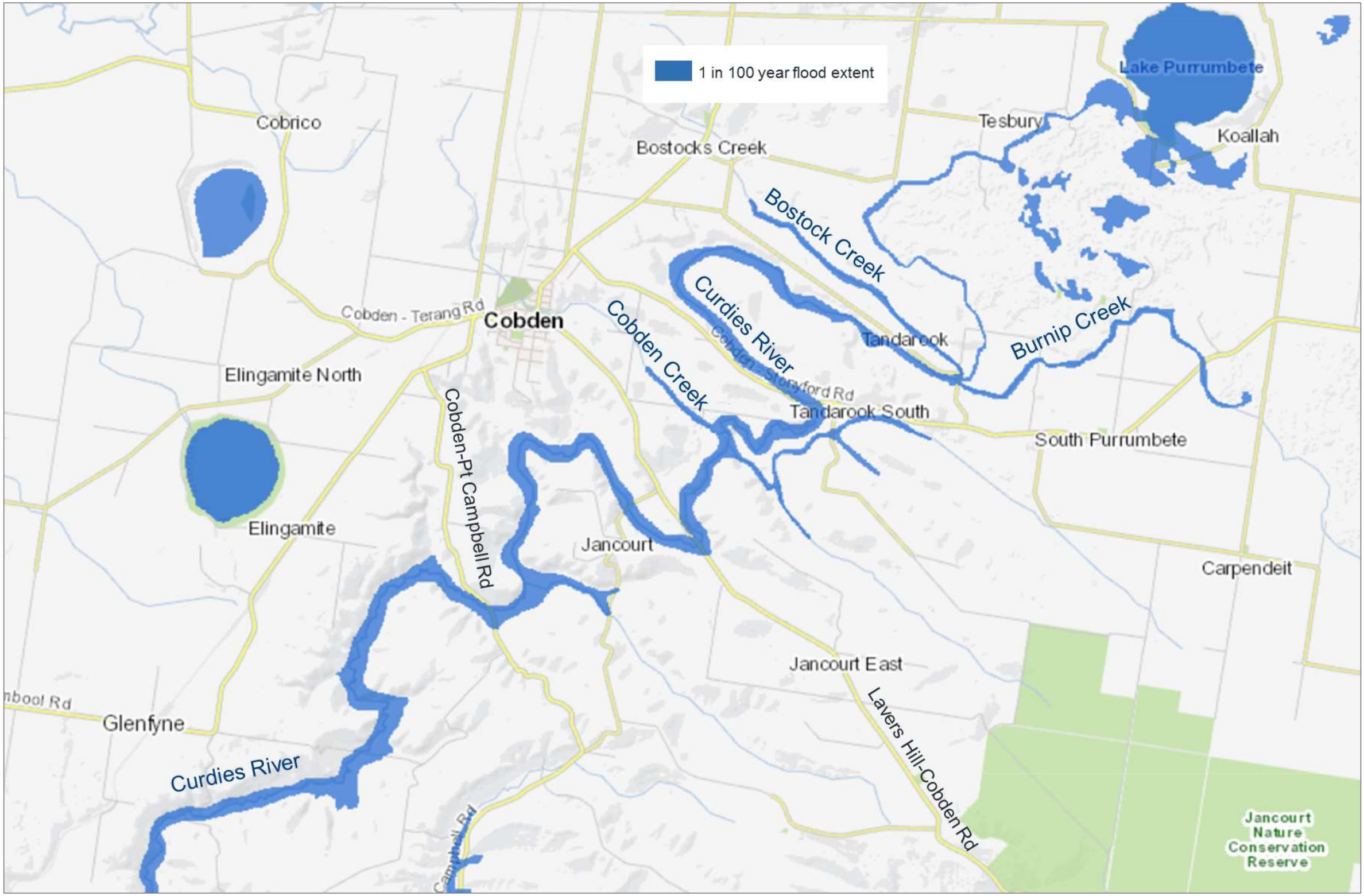


Figure 62. Upper Curdies River 1 in 100 year AEP flood extent (DNRE 2000).

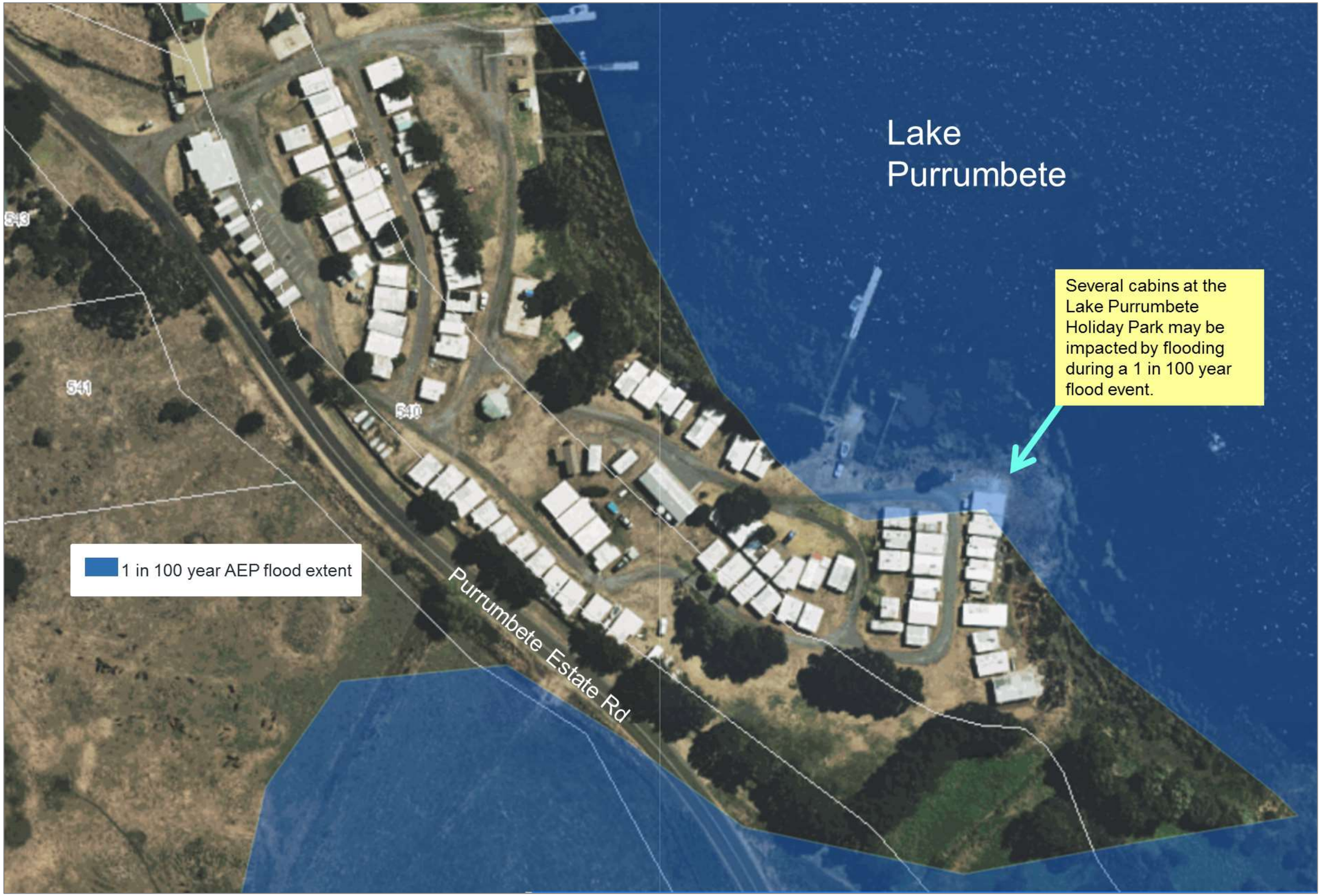


Figure 63. Lake Purrumbete Holiday Park flood risk (DNRE 2000).

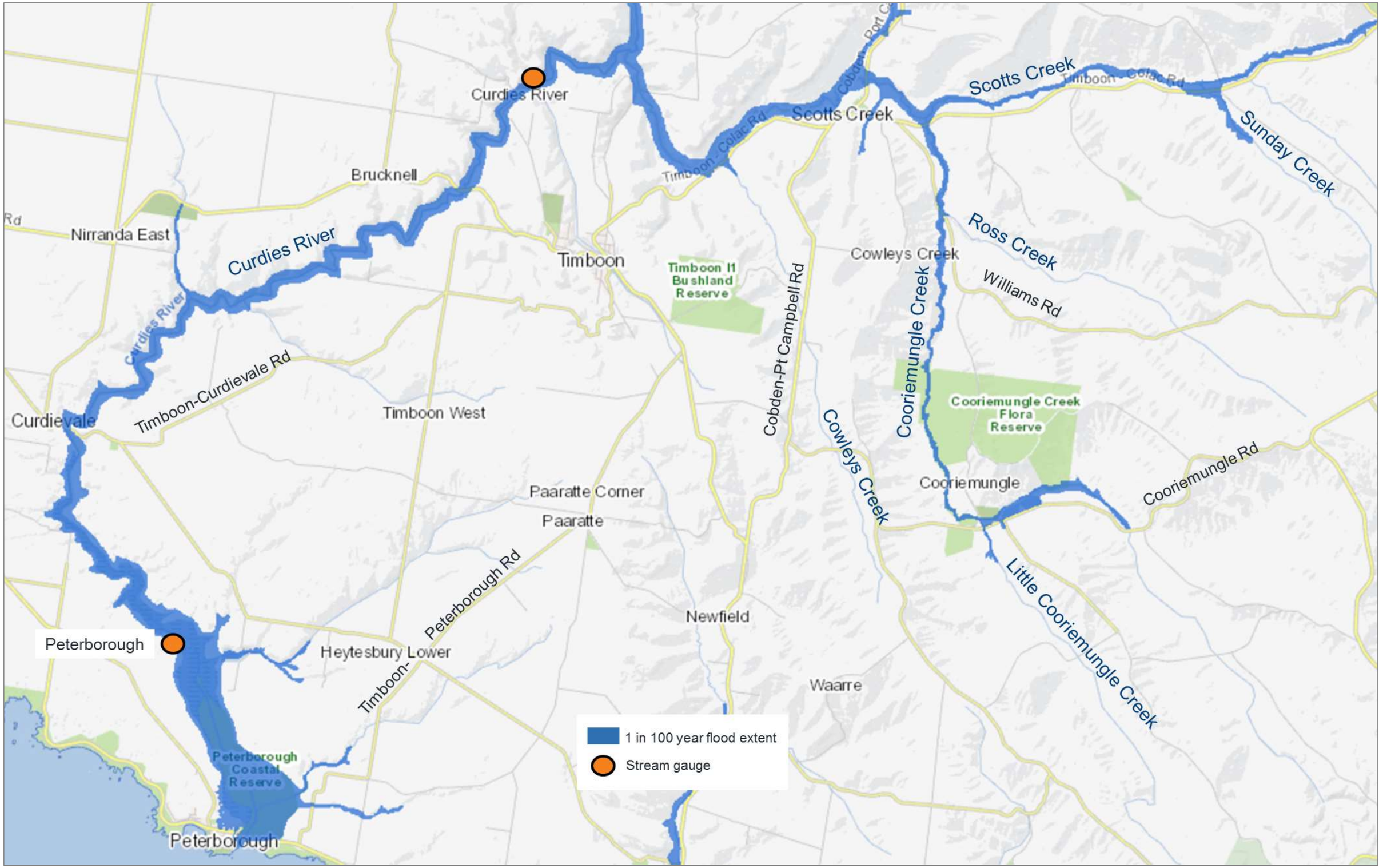


Figure 64. Curdies River 1 in 100 year AEP flood extent (DNRE 2000).

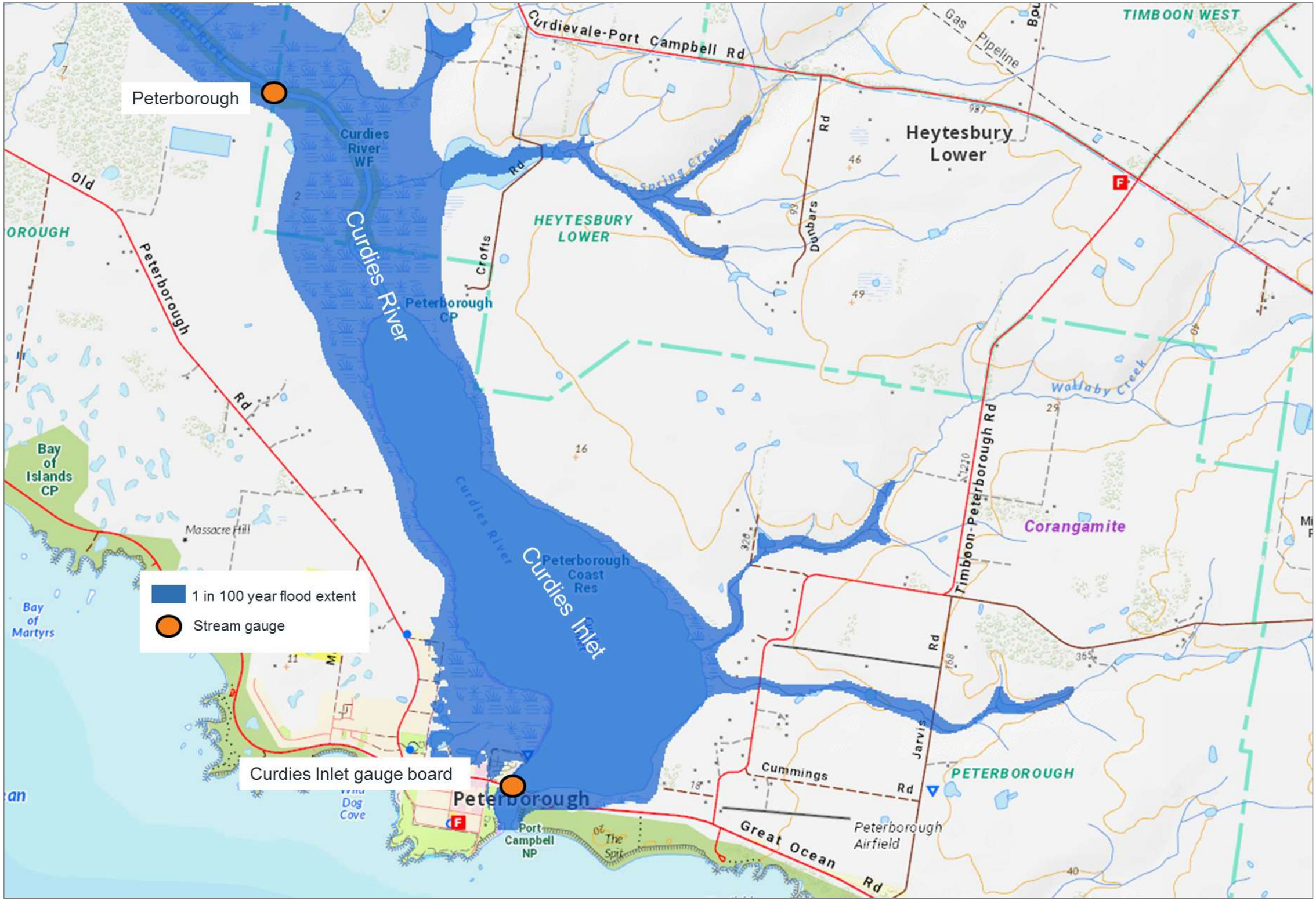


Figure 65. Curdies River 1 in 100 year AEP flood extent (DNRE 2000).

Table 23. Curdies River Flood Intelligence Card

Flood travel time	2018 time from start of rain to steep rise in floodwater at the Curdie gauge 4-6 hours Time between start of steep rise and peak at Curdies gauge 2.5 days 2018 time between Curdie gauge and U/S Peterborough gauge peak 10 hours Riverine flooding duration: 1 to 2 days

Curdies River at Curdie gauge height 235203 (m)	Curdies River, U/S Peterborough gauge height 235268 (m)	Curdies River, Peterborough gauge board, west of Hamilton Street Bridge (m)	Annual Exceedance Probability (1 in year)	Curdies River at Curdie gauge Flows (ML/d) Floodzoom	Consequence / Impact	Roads Impacted	Action
		1.30					
6.13	1.31		September 2016				
4.99	1.5		July 2017				
	1.51	1.50	June 2011				
		1.60	June 2003				
		1.80	June 1997				
4.14	1.74	1.84	August 2013	5,907			
4.36	1.97	2.00	18th June 2018	7,743	Reported rainfall total was 135 mm. The sand bar at the Estuary mouth was unable to be opened. Several Great Ocean Road Caravan Park buildings were flooded above floor.		VICSES activate ground observers to take photos and record flood levels at key roads and gauges.
7.19	1.98		2010	69,639			
		2.02	1929 & 1974				
		2.80	100 year event 1978		Level estimated to be the 100 year flood extent. Damage to farmland adjacent to Curdies River and Scotts Creek. Flooding significantly impacts roads and other infrastructure. Several cabins at the Lake Purrumbete Holiday Park may be impacted by flooding.	Roads that may be impacted by flooding, access could also be cut; Lavers Hill-Cobden Road Cobden – Port Campbell Road Cobden-Stonyford Road Purrumbete Estate Road Timboon-Peterborough Road Timboon-Curdievale Road Timboon-Colac Road Cooriemungle Road Rowes Road Bullaharre Road	Council and Regional Roads Victoria deploy road closure signs and undertake traffic management as needed. Victoria Police undertake evacuations as needed. VICSES sandbag buildings as needed.
		3.10	1966				

^ Estimated property and road impacts using the 1 in 100 year AEP flood extent mapping (DNRE 200).

Appendix D: Flood Evacuation Arrangements

Phase 1 - Decision to Evacuate – Skipton Township

The role of evacuation is the responsibility of Victoria Police. Victoria Police discharge their responsibility for evacuation. Therefore the decision to evacuate is to be made in consultation with the MERO, MERC, DHHS, Health Commander and other key agencies and expert advice (CMA's and Flood Intelligence specialists).

Once the Incident Controller has made the decision to evacuation the IC must notify Victoria Police representative, IMT, IEMT, agency chain of command and incident personnel.

The Incident Controller may make the decision to evacuate an at-risk community under the following circumstances:

- Properties are likely to become inundated;
- Properties are likely to become isolated and occupants are not suitable for isolated conditions;
- Public health is at threat as a consequence of flooding and evacuation is considered the most effective risk treatment. This is the role of the Health Commander of the incident to assess and manage. Refer to the State Health Emergency Response Plan (SHERP) for details);
- Essential services have been damaged and are not available to a community and evacuation is considered the most effective risk treatment.

The following should be considered when planning for evacuation:

- Anticipated flood consequences and their timing and reliability of predictions;
- Size and location of the community to be evacuated;
- Likely duration of evacuation;
- Forecast weather;
- Flood Models;
- Predicted timing of flood consequences;
- Time required and available to conduct the evacuation;
- Evacuation priorities and evacuation planning arrangements;
- Access and egress routes available and their potential flood liability;
- Current and likely future status of essential infrastructure;
- Is cross border assistance required or evacuation to another municipality relief centre?;
- Resources required and available to conduct the evacuation;
- Shelter including Emergency Relief Centres, Assembly Areas etc.;
- Vulnerable people and facilities;
- Transportation;
- Registration
- People of CALD background and transient populations;
- Safety of emergency service personnel;
- Different stages of an evacuation process.

The following **Evacuation Checklist** can be used as a guide when evaluating the need for evacuation in a particular area as a result of flooding.

Key Questions	Answers
Are there any existing Flood Evacuation Plans for the Municipality?	No existing plans
Name of area(s) at risk.	Skipton Township
How many people are at risk (including special needs groups)?	Approximately 50 people
When and where are access routes likely to be disrupted?	• Glenelg Highway (Montgomery Street) at Mt Emu Creek • Park Lane at unnamed creek that flows into Jubilee Lake
Is the area a flood island, accessible by road, accessible overland or land locked?	• Town is divided into two sections (east & west), services can be maintained from each direction. • If unnamed creek levels rise the Health & Aged Care Facility can become isolated & will require access by 4WD or high clearance vehicles only
How much time is available to warn the area? Where Flash Flooding risks exist adopt the strategy detailed in Section 3.8 of this MFEP.	• Peak travel times 12 -24 hrs for riverine flooding • 4 hours depending on level of Jubilee Lake & rainfall
Under what circumstances and in what areas is shelter in place and not evacuation the best option?	Nil, however Health & Aged Care facility could shelter in place
Where are Flood Relief Centres located?	East – Football oval West – CFA Station or Church North East – Health & Aged Care Facility
What are the triggers for evacuation? (i.e. a particular area at a specified gauge height?) – refer to Appendix C of this MFEP.	Use of flood visualisation tool & flood levels at Guthrie's Bridge
How will evacuation warning messages be communicated to people? (i.e. OSOM, Emergency Alert, etc.)	Use of OSOM, Door Knocks, radio, Emergency Alert and other means
Have standard evacuation messages been developed for predicted or likely flood scenarios?	No
What forms of transport are needed to assist with evacuation?	4WD or high clearance vehicle's
Where are airbase facilities located?	Oval
Where are animal shelter compounds located? Any other arrangements for management and accommodation of pets / animals?	Refer to Corangamite Shire Animal Sub Plan

The table below details triggers for evacuation, if these heights are predicted or are likely to occur evacuation should be considered

Sector	Gauge	Trigger
Commercial Sector	Mena Park Gauge (electronic) & Guthrie's Bridge Gauge	4.7 m Moderate Flood Level
Health Sector	Mena Park Gauge (electronic) & Guthrie's Bridge Gauge	4.7 m Moderate Flood Level
Industrial Sector	Mena Park Gauge (electronic) & Guthrie's Bridge Gauge	4.7 m Moderate Flood Level

The table below details time required to evacuate established areas.

Sector	Likely time required for evacuation (including resource assumptions)
Commercial Sector	6 hours
Health Sector	6 Hours
Industrial Sector	6 Hours

Phase 2 – Warning

Warnings may include a warning to 'prepare to evacuate' and a warning to 'evacuate now'. Once the decision to evacuate has been made, the at-risk community will be warned to evacuate. Evacuation warnings should be disseminated via methods listed in section 3.3 of this plan.

Phase 3 – Withdrawal

VICPOL is the responsible agency for evacuation. VICSES will provide advice regarding most appropriate evacuation routes and locations for at-risk communities to evacuate to.

VICSES, CFA, AV and Local Government will provide resources where available to support VICPOL / Department of Transport with route control and may assist VICPOL in arranging evacuation transportation.

VICPOL will control security of evacuated areas.

Evacuees will be encouraged to move using their own transport where possible. Transport for those without vehicles or other means will be arranged as per requirements at the time.

Possible Evacuation Routes to be used:

Sector	Evacuation Route	Evacuation route closure point and gauge height of closure
Commercial Sector	Glenelg Highway (Montgomery Street), Wright Street to known higher ground or Relief Centre at Oval	Nil
Health Sector	Anderson Street to Blake Street & Park Lane	Pak Lane at unnamed creek
Industrial Sector	Glenelg Highway (Montgomery Street), Cleveland Street & Bridge Street to known higher ground or Relief Centre at Oval	Cleveland Street & Bridge Street

Landing zones for helicopters (if possible) are located at:

- Skipton oval

Special needs groups will be / are identified in Council's 'residents at risk' register. This can be done through community network organisations. Further information on Council's 'residents at risk' register can be obtained from the MERO or MRM

Phase 4 – Shelter

Relief Centres and / or assembly areas which cater for people's basic needs for floods may be established to meet the immediate needs of people affected by flooding. Relief / Recovery Centres are listed in the MEMP.

VICPOL in consultation with VICSES will liaise with Local Government and DHHS (where regional coordination is required) via the relevant control centre to plan for the opening and operation of relief centres. This can best be achieved through the Emergency Management Team (EMT).

Animal Shelter

Animal management guidelines are provided in the Corangamite Shire Municipal Emergency Animal Welfare Plan along with the location and contact details for appropriate animal welfare entities.

Matters relating to the welfare of livestock and companion animals (including feeding and rescue) are to be referred to Department of Jobs, Precinct's and Regions (DJPR) – AgVic. This includes requests for emergency supply and / or delivery of fodder to stranded livestock or for livestock rescue.

Matters relating to the welfare of wildlife are to be referred to Department of Environment, Land, Water and Planning (DELWP).

Caravans

Not applicable in Skipton.

Phase 5 – Return

The Incident Controller in consultation with VICPOL will determine when it is safe for evacuees to return to their properties and will arrange for the notification of the community.

VICPOL will manage the return of evacuated people with the assistance of other agencies as required.

Considerations for deciding whether to evacuate include:

- Current flood situation;
- Status of flood mitigation systems;
- Size and location of the community;
- Access and egress routes available and their status;
- Resources required to coordinate the return;
- Special needs groups;
- Forecast weather;
- Transportation particularly for people without access to transport

Disruption to Services

Disruption to a range of services can occur in the event of a flood. This may include road closures affecting school bus routes, truck routes, water treatment plant affecting potable water supplies etc.

Service	Impact	Trigger Point for action	Strategy/ Temporary Measures
Road Closure – Glenelg Highway	Road Closed due to water over road	Once public safety is compromised	Divert Traffic
Road Closure – Cleveland Street	Road Closed due to water over road	Once public safety is compromised	Road Closure
Road Closure – Smythe Street Ford	Road Closed due to water over road	Once public safety is compromised	Road Closure

Essential Community Infrastructure and Property Protection

Essential Community Infrastructure and properties (e.g. residences, businesses, roads, power supply etc.) that require protection are:

Facility	Impact	Trigger Point for action	Strategy/ Temporary Measures
Central Highlands Water Sewer Pump Station Rear of 7 Anderson Street, Skipton	Flooding of wet well & above ground control cabinet	Moderate Flood Level expected	Protect control cabinet to stop water from entering. This pump station caters for 4 properties in Anderson Street (7, 9, 11 & 13)
Central Highlands Water Sewer Pump Station Cnr Montgomery & Cleveland Street, Skipton	Flooding of wet well & above ground control cabinet	Moderate Flood Level expected	Sand bag doorway and control cabinets to stop water from entering. This is the main pump station for Skipton township.
Central Highlands Water Sewer Pump Station Smythe Street, Skipton	Flooding of wet well & above ground control cabinet	Major Flood Level expected	Protect control cabinet to stop water from entering. This is a major pump station for Skipton township.
Glenelg Highway	Road impassable	Moderate Flood Level expected	Traffic Diversions need to be implemented

Corangamite Shire Council will establish a sandbag collection point at the Skipton Sandbag Facility, refer to Appendix I for further details.

Appendix E: Public Information and Warnings

VICSES uses EM-COP Public Publishing to distribute riverine and flash flood warnings in Victoria. The platform enables automatic publishing to the VicEmergency app, website and hotline (1800 226 226). Communities can also access this information through VICSES social media channels (Victoria State Emergency Service on Facebook and VICSES News on Twitter) and emergency broadcasters, such as Sky News TV and various radio stations (current list available via the EMV website).

VICSES Regions (or ICCs where established) lead the issuing of warnings for riverine flood events when pre-determined triggers are met (issuing of a BOM Flood Watch or Warning), and share locally tailored information via the standard VICSES communication channels (social media, traditional media, web and face to face). These activities are coordinated by the VICSES RDO and approved by the VICSES RAC, or the PIO and IC respectively (when an ICC is active).

If verified reports are received of flash flooding posing, or resulting in, a significant threat to life or property, VICSES Regions (or ICCs) will issue a flash flood warning product via EM-COP.

VICSES at the state tier (or SCC Public Information Section) plays an important role in sharing riverine and flash flood information via state-based standard communication channels.

During some emergencies, VICSES may alert communities by sounding a local siren, or by using the Emergency Alert (EA) platform to send an SMS to mobile phones or a voice message to landlines. The use of sirens for higher-end warnings has been pre-determined, and mapped to relevant warning templates in EM-COP.

Department of Transport and Corangamite Shire Council will communicate community information regarding road closures. Information will be updated on the VIC Traffic website: https://traffic.vicroads.vic.gov.au/

EM-COP Public Publishing Business Rules for Riverine and Flash Flood are available in the **Public Information tab of the IMT Toolbox,** providing further guidance on specific triggers, roles and responsibilities. VICSES SOP057 and JSOP 04.01 provide further guidance.

EMERGENCY ALERT. BE WARNED. BE INFORMED.	**EMERGENCY ALERT** As required, subject to individual circumstances, weather conditions, potential impacts and duration. Refer VICSES SOP057.	As required, based on conditions, changed conditions or impacts of the flood event. Circumstances which warrant the use of EA include: • EA is likely to contribute to saving lives and property • EA is likely to be the most effective way to warn the community in an actual or likely emergency • Alternative channels have been considered and alone may not achieve objectives • Time is of the essence and specific action following the receipt of the warning is required The message is of critical importance and needs to be delivered to a specific geographic area
Pre-populated Corangamite Shire Emergency Alert key messages for a severe flash flood event High velocity floodwater may cause risk to life for pedestrians and motorist. Access to main roads may be cut. Advise to shelter in place if it is safe to do so. The flood peak is likely to pass within 12 to 24 hours.		

	**EMERGENCY ALERT** As required, subject to individual circumstances, weather conditions, potential impacts and duration. Refer VICSES SOP057.	As required, based on conditions, changed conditions or impacts of the flood event. Circumstances which warrant the use of EA include: • EA is likely to contribute to saving lives and property • EA is likely to be the most effective way to warn the community in an actual or likely emergency • Alternative channels have been considered and alone may not achieve objectives • Time is of the essence and specific action following the receipt of the warning is required The message is of critical importance and needs to be delivered to a specific geographic area

Pre-populated Corangamite Shire Emergency Alert key messages for a severe flash flood event
The BOM have issued a Severe Weather Waring: Heavy Rain

Heavy rainfall forecast by the BOM may lead to riverine flooding. Falls are expected to be between ???mm and ???mm. Locally heavier falls are possible due to embedded thunderstorms that could cause severe flooding.

Locations which may be affected include: Skipton and the rural areas along the Mount Emu Creek, Gellibrand River and Curdies River catchments.

Widespread flooding may occur.
Keep clear of creeks and storm drains
Stay clear of fast moving floodwater. Floodwater is expected to rise quickly and will cause risk to life for pedestrians and motorist.
Flooding may cause extensive inundation of buildings.
Properties are likely to be isolated. If your property is impacted by flooding, we advise you to shelter in place if it is safe to do so.
The flood peak is likely to pass quickly, within 12 hours.
Floodwater may cut access to main roads, avoid driving until the storm and floodwater has subsided.

Waterways likely to be affected include:

- Mount Emu Creek
- Baillie Creek
- Curdies River
- Gellibrand River

SES advises that all community members should:
Never walk, ride or drive through floodwater, Never allow children to play in floodwater, Stay away from waterways and stormwater drains during and after heavy rain, Keep well clear of fallen power lines Be aware that in fire affected areas, rainfall run-off into waterways may contain debris such as ash, soil, trees and rocks, and heavy rainfall increases the potential for landslides and debris across roads.

For emergency assistance contact the SES on 132 500.

Current Road and Traffic Information is available at the VicRoads website: http://traffic.vicroads.vic.gov.au

Weather Forecast:

For the latest weather forecast see http://www.bom.gov.au/vic/forecasts/

Appendix F: Flood Maps

Figure 66. Mt. Emu Creek 1 in 100 AEP flood extent (Water Technology 2020).

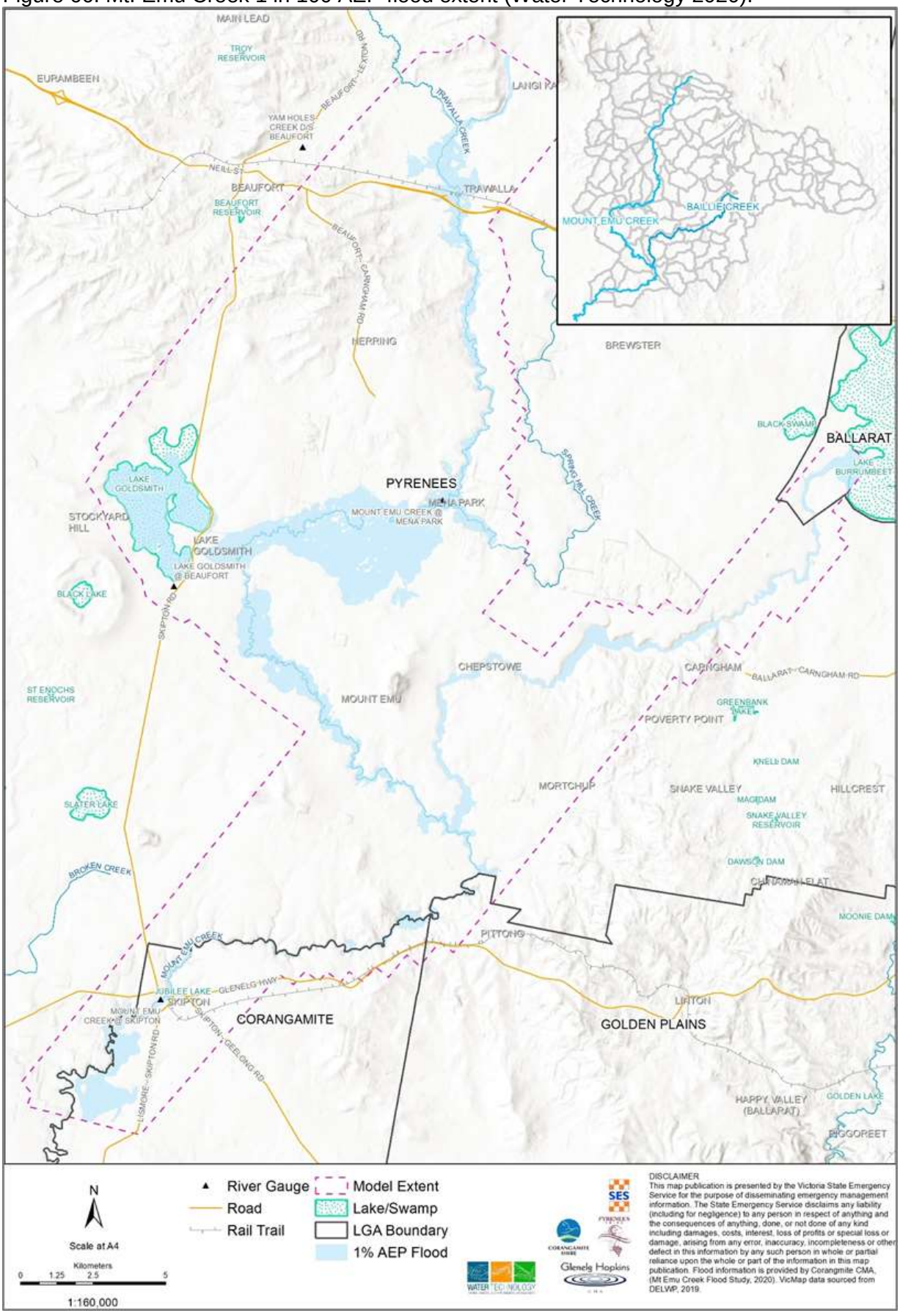


Figure 67. Skipton 1 in 5 AEP (20%) flood extent (Water Technology 2020).

Figure 68. Skipton 1 in 20 AEP (5%) flood extent (Water Technology 2020).

Figure 69. Skipton 1 in 50 AEP (2%) flood extent (Water Technology 2020).

Figure 70. Skipton 1 in 100 AEP (1%) flood extent (Water Technology 2020).


MOUNT EMU CREEK @ SKIPTON
Gauge Station 236203
Gauge Height (m)
FLOOD GAUGE
Historic level (m)
This Map 6.58 m* (0.2% AEP)
Jan 2011 Flood 6.03 m
Sep 2010 Flood 4.96 m
MURRAY ST
DEAN ST
PARK LANE
MITCHELL ST
WEST BOUNDARY RD
BEAUFORT RD
DAWSON ST
BRIDGE ST
BLAKE ST
MONTGOMERY ST
GLENELG HWY
LYONS ST
ANGUS ST
SMYTHE ST
ANDERSON ST
WRIGHT ST
ANDREW ST
CURRIE ST
HARDY ST
LISMORE RD
OSBORNE ST
JOHNSON ST
SCOTT ST
STATION ST
VOWLES ST
SKIPTON-CAMPERDOWN RD
DUMBOY-SKIPTON RD
DALY RD
skipton
B180
N
Scale at A4
Metres
0 100 200 400
Police Station
Church
Nursing Home
Hospital
Fire Station
School
Rail Trail
Model Extent
Roads Inundated by More than 300mm (0.2% AEP)
0.2% AEP Depth (m)
Less than 0.3
0.3 - 0.5
0.5 - 1.0
1.0 - 2.0
More than 2.0
SES
Glenelg Hopkins
DISCLAIMER
This map publication is presented by the Victoria State Emergency Service for the purpose of disseminating emergency management information. The State Emergency Service disclaims any liability (including for negligence) to any person in respect of anything and the consequences of anything done, or not done of any kind including damages, costs, interest, loss of profits or special loss or damage, arising from any error, inaccuracy, incompleteness or other defect in this information by any such person in whole or partial reliance upon the whole or part of the information in this map publication. Flood information is provided by Corangmite CMA, (Mt Emu Creek Flood Study, 2020). VicMap data sourced from DELWP, 2019.

Figure 72. Skipton road flood impacts for all design flood events (Water Technology 2020).

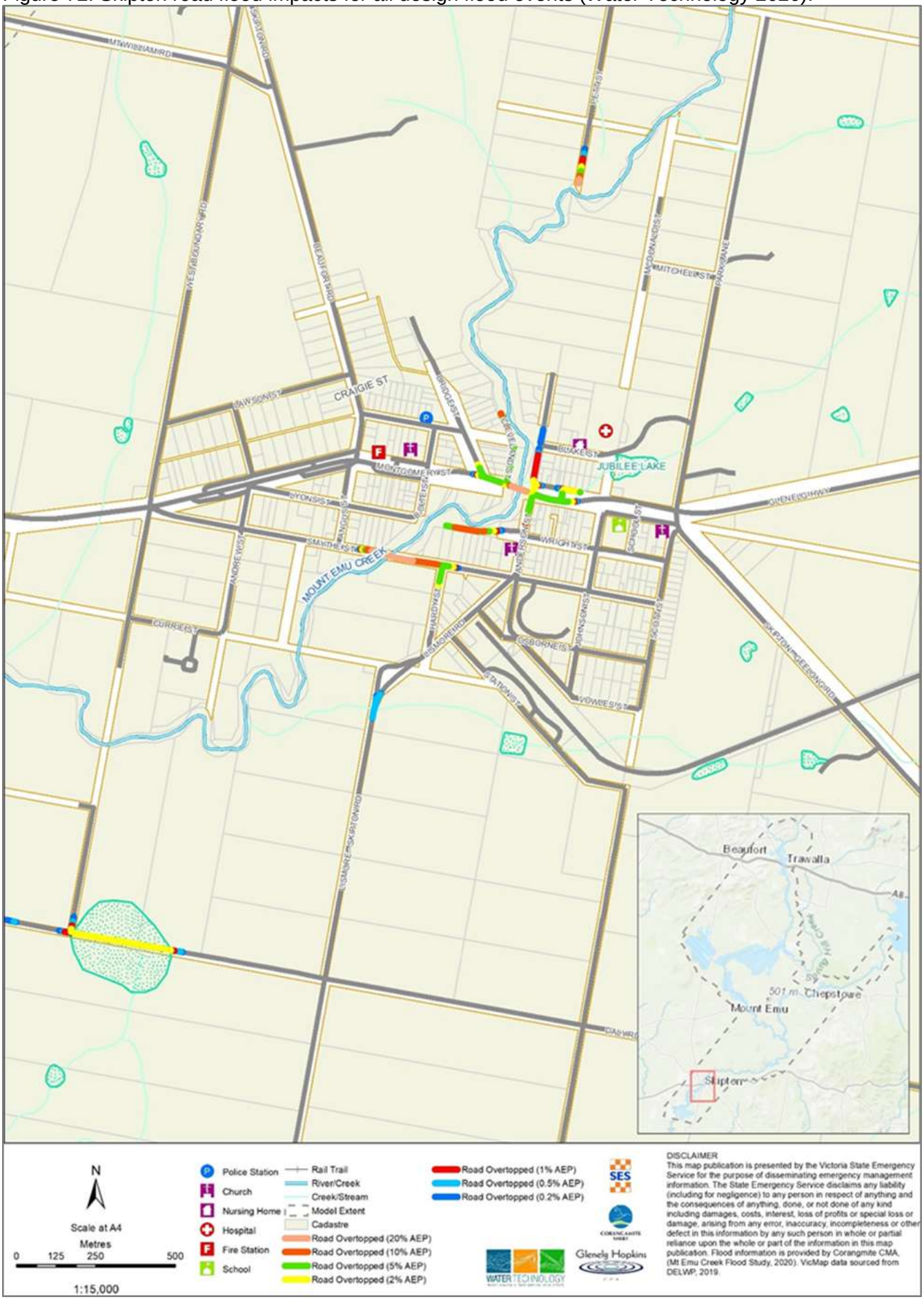
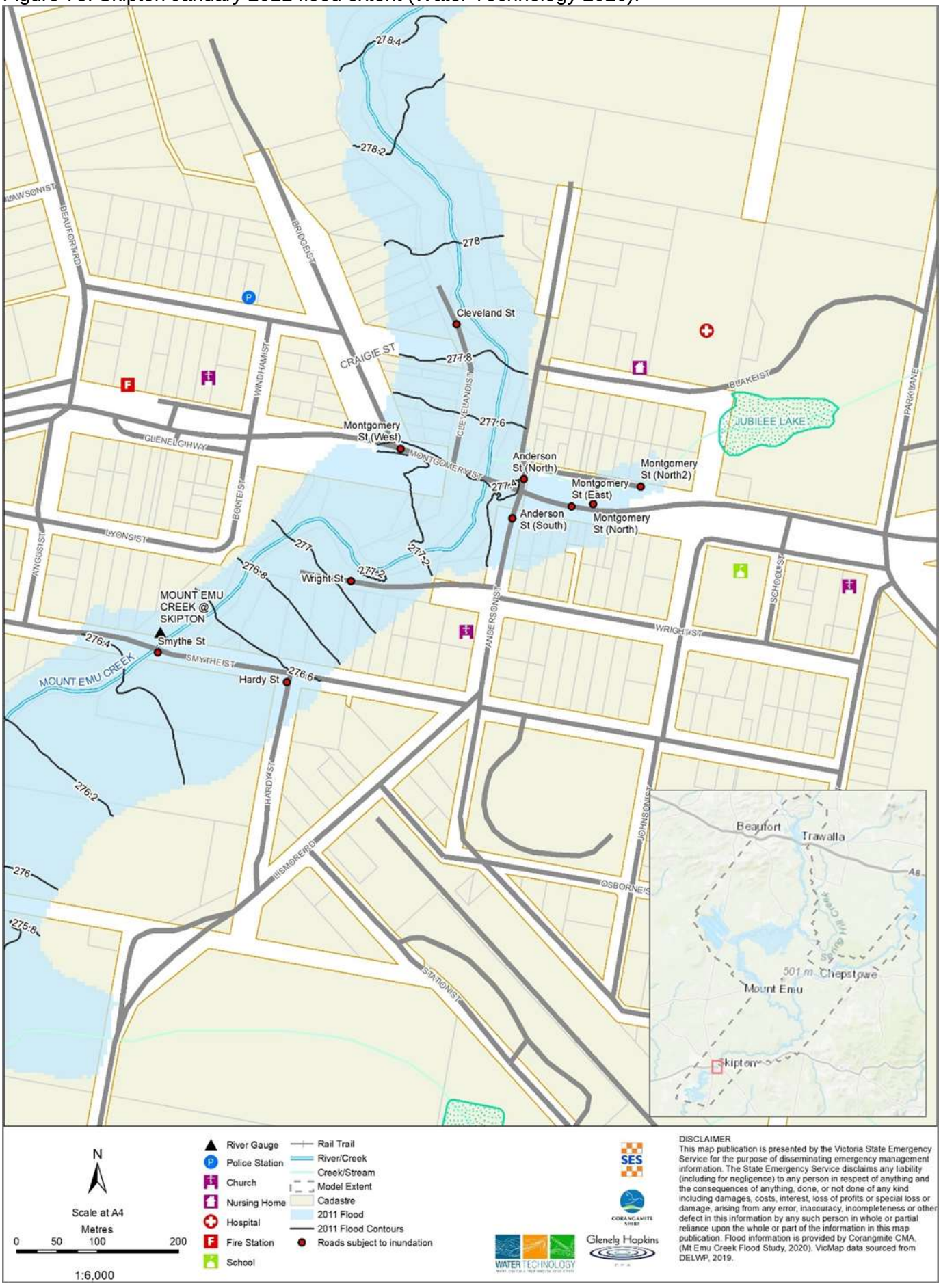


Figure 73. Skipton January 2011 flood extent (Water Technology 2020).



Appendix G: Flood Observers

As control agency for flood in Victoria, VICSES is committed to ensuring the incorporation of local knowledge in decision making before, during and after incidents.

Information from community sources including but not limited to observations, historical information and information about current and possible consequences of an incident may be utilised to help inform the process of incorporating local knowledge into decision making during an incident. Community observers and agency staff will help support this process.

Flood Observers

When a VICSES Incident Control Centre is activated with knowledge of a potential flooding event, Flood Observers should be contacted to determine their availability to assist. The process for activating flood observers is as flows:

*VICSES Flood Observers – The Intelligence Cell in consultation with the RDO/RAC will contact the Unit Duty Officer (UDO) of Units with Flood Observers in the area where observations are required. The UDO will contact Flood Observers to determine their availability. Available Flood Observers names and contact details will be provided to the intelligence cell from the UDO so they can be contacted and activated under normal resourcing arrangements.

In no-notice flash flooding events, the full list of observers will be provided by the RDO or RAC to the Incident Controller, for use by the Intelligence Cell once activated.

If non VICSES Flood Observers witness an unexpected significant flood event, they will notify VICSES via the 132 500 phone number and share flood photos via the Snap Send Solve app.

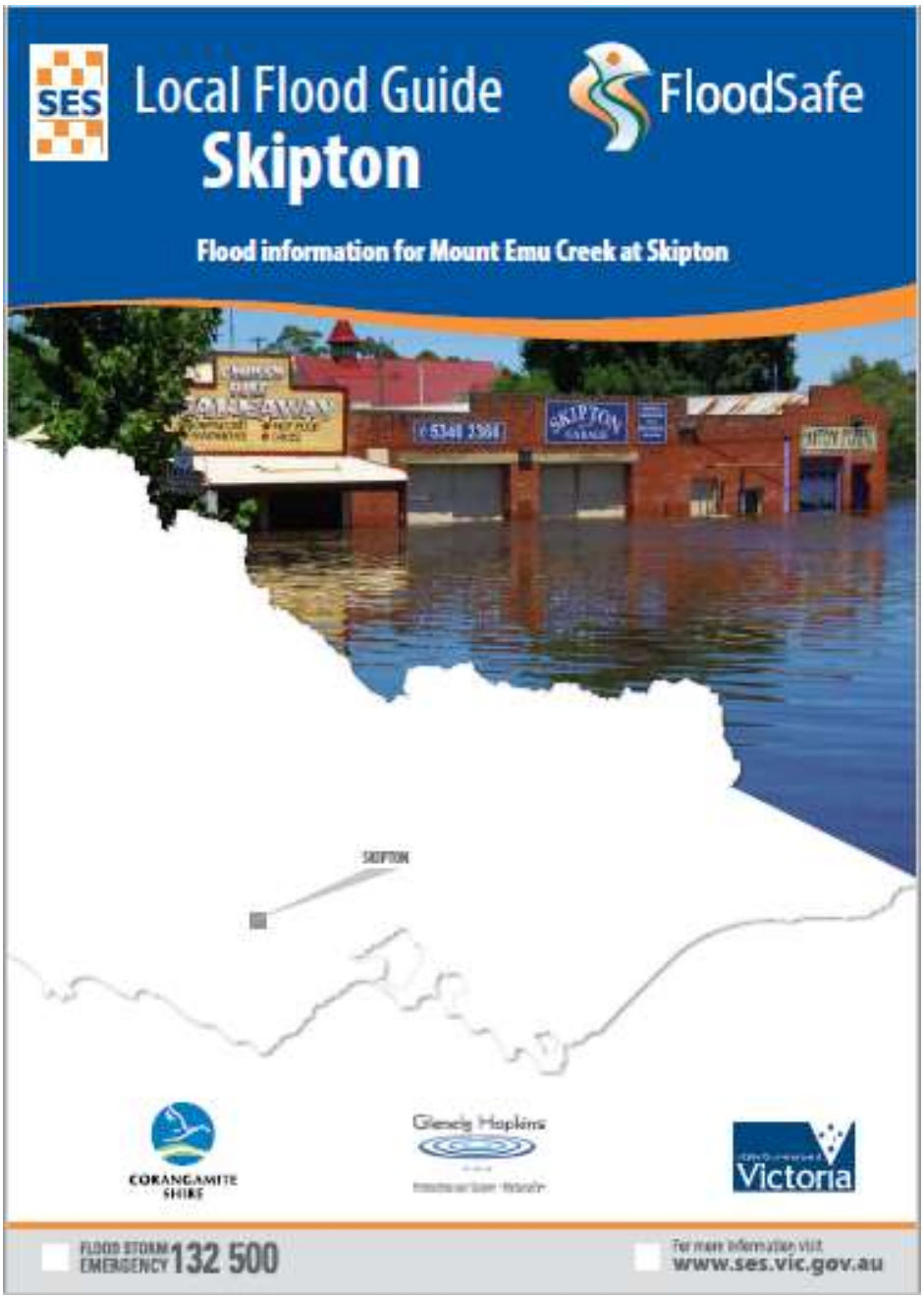
Targeted Flood Observer training will be undertaken by VICSES on an as needs basis for high flood risk towns where limited stream gauge monitoring is available.

Appendix H: Local flood information

Only one Local Flood Guide has been developed for the Corangamite Shire Council;

- Refer to the link below for the Skipton Local Flood Guide

- Skipton Local Flood Guide



Appendix I: Corangamite Shire Community Sandbag Collection Points

Triggers to start prefilling sandbags and setting up community sandbag collection points;

- BOM flood watch has been issued for the town / catchment area
- Significant rainfall is predicted for the town/catchment area (greater than 50mm)
- BOM has high certainty the rainfall event will impact a town/catchment area listed below.
- Flooding is immanent

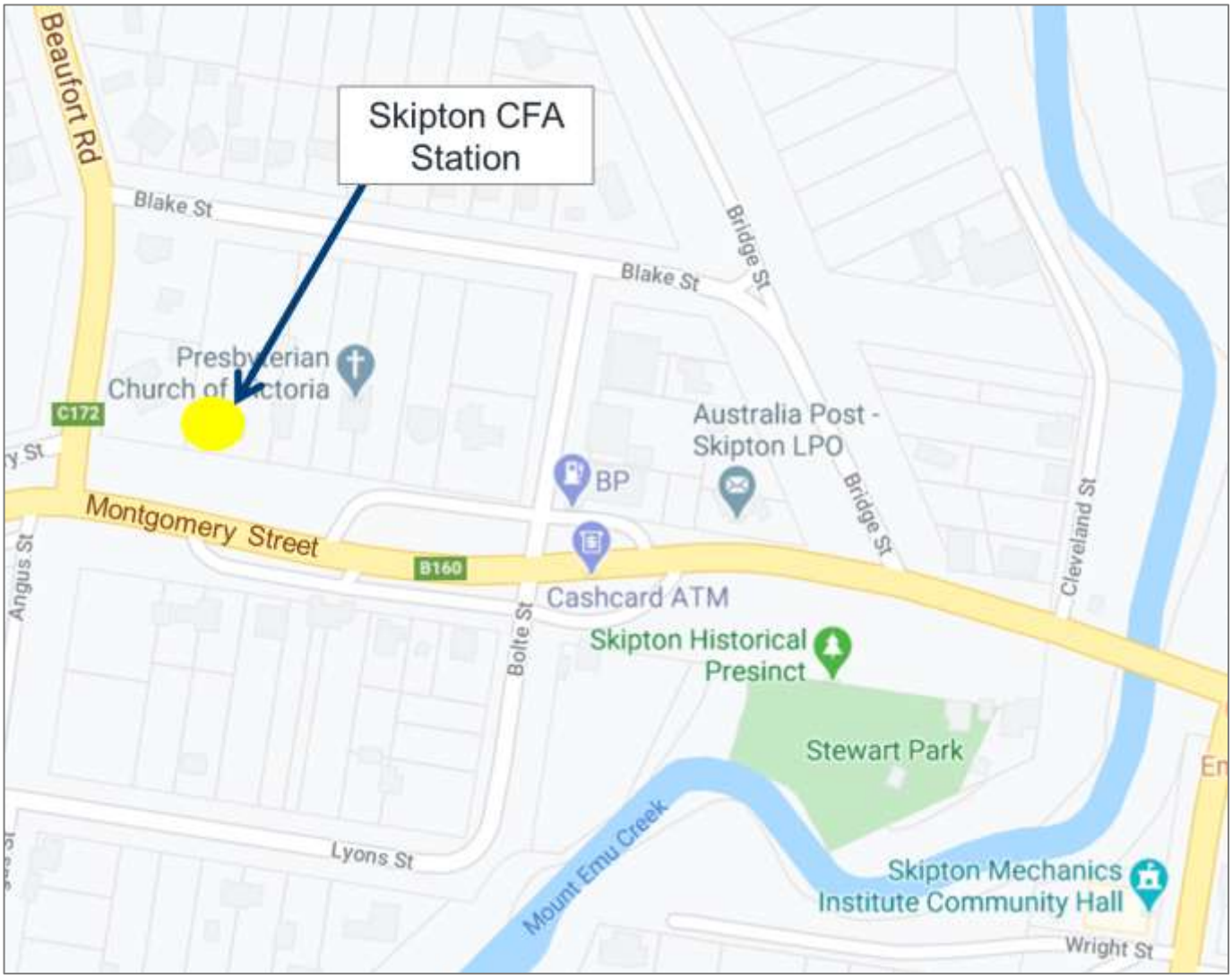
When needed community sandbag collection points will be set up at;

- Skipton CFA Station: 56 Montgomery Street, Skipton.

Refer to the list below of key tasks that may be undertaken to prepare sandbag filling and community sandbag collection points.

Agency	Task Description
VICSES	Deliver sandbags to the council depot or other nominated sandbag filling point to prefill the sandbags.
Corangamite Shire	Deliver sand to sandbag filling points documented below.
Corangamite Shire / VICSES / CFA	Deliver prefilled sandbags either directly to buildings that need to be sandbagged or to the nominated community Sandbag collection point. Provide staff/volunteers to set up the community sandbag point. Provide staff/volunteers to distribute prefilled sandbags to the community.
Corangamite Shire / VICSES	Notify the community of the location of the community sandbag collection point via local radio and social media channels.

Skipton Sandbag Filling and Community Collection Point: the Skipton CFA Station: 56 Montgomery Street, Skipton (refer to map below).



A sandbag collection facility has been installed at the rear of the Skipton CFA Station. The best entry is off Blake Street, Skipton. The Skipton Community Sandbagging Facility allows the community to fill and collect sandbags in and from a safe location. Refer to photos and a description of the contents of the Skipton Sandbag Facility below.

The Skipton Sandbag Facility consists of:

- 15m x 10m reinforced concrete slab, 150mm thick.
- Side Opening Shipping container for storage.

The Skipton Sandbag Facility is stocked with the following items.

- 16,000 Sandbags
- Empty pallets to stack filled sandbags
- Bag Trolley for shifting sandbag bundles
- Shovels and Brooms
- Safety Bollards and SES Barrier Tape
- Rope
- Bottled Water
- Signage giving instructions to fill sandbags
- Sandbag filling devices (currently being manufactured by Lismore unit)

Keys for the facility are located at:

- Skipton CFA
- VICSES Regional Office Geelong
- Lismore SES Unit

Skipton Sandbag Facility.

Contents of the Skipton Sandbag Facility.

References

Corangamite Shire (2012): Cobden Dam: Dam Safety Emergency Plan

Corangamite Shire (2012): Skipton Dam: Dam Safety Emergency Plan

Department of Natural Resources and Environment (DNRE) (2000): Flood Data Transfer Project – – Flood Data and Flood Planning Maps as well as Flood Mapping and River Basin Reports.

DSEP Dam at 270 Batemans Road, Boorcan (Trim D/14/40589)

First Australian Farmaland (May, 2013): Dam Surveillance Program and Emergency Management Plan for Yoolburra Dam, 139 Latrobe Road, Princetown (Trim D/13/15263)

GHD (2012a): Scanning Risk Assessment: Report for Skipton Dam. Report prepared for Corangamite Shire Council, July 2012.

GHD (2012b): Scanning Risk Assessment: Report for Cobden Dam. Report prepared for Corangamite Shire Council, July 2012.

GHD (2004): Review of the Operation of the CCMA Regional Drainage Schemes, Background Report.

Keller R.J. & Associates (1996): Flood Study of the Wendouree Area West of the Midland Highway and of the Miners Rest Area: Report prepared for City of Ballarat, June 1996.

Keller R.J. & Associates (1993): Flood Study of Invermay Area: Report prepared for Shire of Bungaree, August 1993.

Lawson & Treloar (2003): Floodplain Management Plan for Lake Burrumbeet and Burrumbeet Creek Catchment: December 2003.

TGM group (2004): Beaufort Flood Scoping Study. Consulting report prepared for Glenelg Hopkins Catchment Management Authority, November 2004.

Water Technology (2020): Upper Mt. Emu Creek Flood Investigation Flood Warning Report, April 2020.

Water Technology (2020): Upper Mt. Emu Creek Flood Investigation Hydraulic Modelling Report, May 2020.

Water Technology (2020): Upper Mt. Emu Creek Flood Investigation Mitigation Report, April 2020.

Water Technology (2020): Upper Mt. Emu Creek Flood Investigation Summary Report, May 2020.

Water Technology (2012): Skipton Flood Investigation Report.

2020 Engineering Solutions (July, 2014), Dam Surveillance Program & Emergency Plan for Nos. 1 & 2 Irrigation Dams, 463 Moreys Road, Brucknell (Trim D/14/28515)

2020 Engineering Solutions (August 2014), Dam Surveillance Program & Emergency Plan for Evans Dam, 357 Batemans Road, Camperdown (Trim D/14/33154)

2020 Engineering Solutions (September 2014), Dam Surveillance Program and Emergency Management Plan for Molloys Dam, 869 Cobden-Terang Road, Cobrico (Trim D/14/37737)

Other sources of information of direct relevance to the Municipality include:

- http://www.ghcma.vic.gov.au
  Glenelg Hopkins Catchment Management Authority for various references
- http://www.ccma.vic.gov.au
  Corangamite Catchment Management Authority for various references
- http://www.water.vic.gov.au/environment/floodplains

  for flooding information including mapping
- URS (2006): Camperdown Urban Stormwater Plan, March 2006.
- URS (2007): Terang Stormwater Quality and Minor Flooding Study, July 2007.