Hepburn Shire Council

FLOOD EMERGENCY PLAN

A Sub-Plan of the Municipal Emergency Management Plan

For Hepburn Shire Council
and
VICSES Hepburn Shire and Ballarat Units

Version 3, June 2020

Table of Contents

Distribution of 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, VicRoads, DHHS, relevant utilities, MFB, MERC, RERC, Police station, VICSES Units, VICSES Regional office, CFA Brigades, CFA Regional office and North Central CMA.

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 via MidWest@ses.vic.gov.au.

The VICSES Municipal Flood Emergency Plan template version 6.0 was used to develop this Plan.

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
V 0.1	August 2019	Tony Grimme	Update into new template, additional maps.
V 1	February 2020	Clare Mintern	Report rewrite.
V 2.7	March 2020	Clare Mintern	Incorporated feedback from the Hepburn MEMPC.
V 3	June 2020	Clare Mintern	Final Version

This Plan will be maintained on the VICSES website at www.ses.vic.gov.au/get-ready/your-local-flood-information and Hepburn Shire Council website https://www.hepburn.vic.gov.au/page/HomePage.aspx

List of Abbreviations & Acronyms

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

Part 1. Introduction

1.1 Approval and Endorsement

This Municipal Flood Emergency Plan (MFEP) has been prepared by VICSES, North Central CMA and Hepburn Shire Council staff and with the authority of the Hepburn Shire Municipal Emergency Management Planning Committee (Hepburn Shire MEMPC) pursuant to Section 20 of the Emergency Management Act 1986 (as amended).

VICSES staff has undertaken consultation with the Hepburn Shire staff, North Central CMA staff, Hepburn Shire and Ballarat VICSES Unit members regarding the arrangements contained within this plan.

This MFEP is a sub plan to the Hepburn Shire 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 Mid West Regional Flood Emergency Plan (RFEP) and the State Emergency Response Plan (SERP) – 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 Hepburn Shire MEMPC as a sub-plan to the MEMP.

Approval

Stephen Warren Date 30 March 2020

Grampians Mid West Region VICSES Regional Manager

Endorsement

Bruce Lucas Date 18 June 2020

Chair – Municipal Emergency Management Planning Committee

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 Hepburn Shire.

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.

1.2 Municipal Flood Planning Committee (MFPC)

Membership of the Hepburn Shire 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 Manager, Drainage Engineer, Statutory Planning Officer)
- Victoria Police (i.e. Municipal Emergency Response Co-ordinator) (MERC),
- North Central Catchment Management Authority (CMA),
- Department of Health and Human Services (DHHS) as required,
- Department of Environment, Land, Water and Planning (DELWP) as required,
- Central Highlands Water and Goulburn Murray Water
- Bureau of Meteorology as required,
- Local community representatives and
- CFA

1.3 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

2.1 Community Engagement and Awareness

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

VICSES with the support of Hepburn Shire and North Central CMA will coordinate targeted community flood engagement programs within the council area.

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

2.2 Structural Flood Mitigation Measures

Hepburn Shire Council has undertaken flood mitigation works in Creswick. Refer Appendix C for more details regarding these flood mitigation works.

2.3 Non-structural Flood Mitigation Measures

2.3.1 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 annual basis and reviewed in line with Section 1.4.

2.3.2 Flood Warning

Arrangements for Bureau issued Flood Watch and Flood Warning products are contained within the 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.**

2.3.3 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 H.**

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) VICSES – Mid West Region or Regional Agency Commander (RAC).

The VICSES Incident Controller (IC)/RDO will activate agencies as required as documented in the State Emergency Response 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 Hepburn Shire. These agencies will be engaged through the IEMT (Incident Emergency Management Team) when enacted or via the RAC when the IEMT is not enacted.

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 Flood Emergency Plan.

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 / ICC will liaise with the centre directly if no Division/Sector Command is 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 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 Hepburn Shire 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 the Control Agency (i.e. VICSES).

Pre-determined ICC locations are available in the MEMP.

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:

Incident Level	ICC / ICP	Division	Division Control Point	Sector	Sector Control Point
Level 2-3	Ballarat ICC	South	Wendouree CFA	Creswick	Creswick CFA Station
Level 2-3	Ballarat ICC	North	Wendouree CFA LHQ	Clunes	Clunes CFA Station
Level 1	Creswick: Hepburn Shire SES				
Level 1	Clunes: Hepburn Shire SES				

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).

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 Hepburn Shire, 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

SOP008 and SOP009 outline in detail the actions to be undertaken upon receipt of a Flood Watch/Flood Warning or Severe Weather Warning. VICSES RDO (until an incident controller is appointed) or IC will undertake actions as defined within the flood intelligence cards (**Appendix C**). General considerations by the IC/VICSES RDO will be as follows:

- 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 EMT.
- 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

VICSES RDO (until an incident controller is appointed) or IC will undertake actions as defined within the flood intelligence cards **(Appendix C).** General considerations by the IC/VICSES RDO will be as follows:

- Develop an appreciation of current flood levels and predicted levels. Are floodwaters, rising, 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 (i.e. water and 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

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. 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.

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 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;
3. Where it is likely people will become trapped by floodwaters due to limited evacuation options safety advice needs to be provided to people at risk. Advice should be given to not attempt to flee by entering floodwaters if they 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 Hepburn Shire 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

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

Once the decision is made Victoria Police 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.

Victoria Police 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 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. 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 Hepburn Shire to assist with rescue operations:

- Flood Rescue boats are located at Ballarat, Hepburn and Bacchus Marsh Units.
- Ballarat Unit and Ballarat CFA have a land based Swift Rescue Team.
- HEMS 4 Rescue helicopter is located at Essendon Airport.

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:

- Ballarat Aerodrome, off Learmonth Road, Mitchell Park.

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 Hepburn Shire Council maintains a small stock of sandbags that will be made available at community collection points at Alfredton and Miners Rest. These details will be advertised by both VICSES and Hepburn Shire at appropriate times prior to and during an event. Back-up supplies are available through the VICSES Regional Headquarters. 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 North Central CMA, LGA and Victoria Police 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 points.

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 Hepburn Shire.

3.12 Road Closures

Hepburn Shire and Regional Roads Victoria 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. Hepburn Shire staff should also liaise with and advise Regional Roads Victoria as to the need or advisability of erecting warning signs and / or of closing roads and bridges under its jurisdiction. Regional Roads Victoria is responsible for designated main roads and highways and councils are responsible for the designated local and regional road network.

Regional Roads Victoria and the Hepburn Shire 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 contained 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 Hepburn Shire 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

VICSSES 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 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 recovery from a flood incident within the Hepburn Shire are detailed in the Hepburn Shire MEMP.

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. Refer to Part 4of the EMMV for details of the range of emergency relief services that may be provided.

Suitable relief facilities identified for use during floods are detailed in **Appendix D** and the MEMP.

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 DJPR.

Requests for emergency supply and/or delivery of fodder to stranded livestock or for livestock rescue are passed to DJPR.

Matters relating to the welfare of wildlife are to be referred to DELWP.

4.4 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 location of the transition arrangements is available in the MEMP

Appendix A: Flood threats for the Hepburn Shire

This Appendix is to provide a broad overview of flood risk within the Municipality. Detailed Flood Risk Information for Individual Communities should be detailed in **Appendix C.**

5.1 Stormwater and Riverine Flooding

Hepburn Shire Council is subject to flash flooding, with large storm events resulting in many of the urban stormwater drainage systems and watercourses within the municipality exceeding their capacity and breaking out of bank. Flooding affects a large number of urban properties, many local and larger roads and, outside of Creswick and Clunes, rural areas along waterways.

The Hepburn Shire has a long history of riverine flood events. Towns impacted by riverine flooding include Creswick, Clunes, Daylesford, Hepburn Springs, Newlyn North and Smeaton. Refer to the map below.

Although there is little flood risk information for Daylesford, Coomoora, Hepburn Springs, Newlyn North and Smeaton, the North Central CMA are currently undertaking rapid flood risk assessments for these towns. These results will be incorporated into this Plan when they become available.

Due to Creswick's location, within the upper catchment of Creswick Creek, the onset of flooding can occur within 30 minutes after heavy rainfall.

Flood events within the Hepburn Shire have been infrequent over the last decade, significant flood events have occurred in 1869, 1870, 1889, 1893, 1901, 1909, 1916, 1933, 1975, 2010 and 2011.

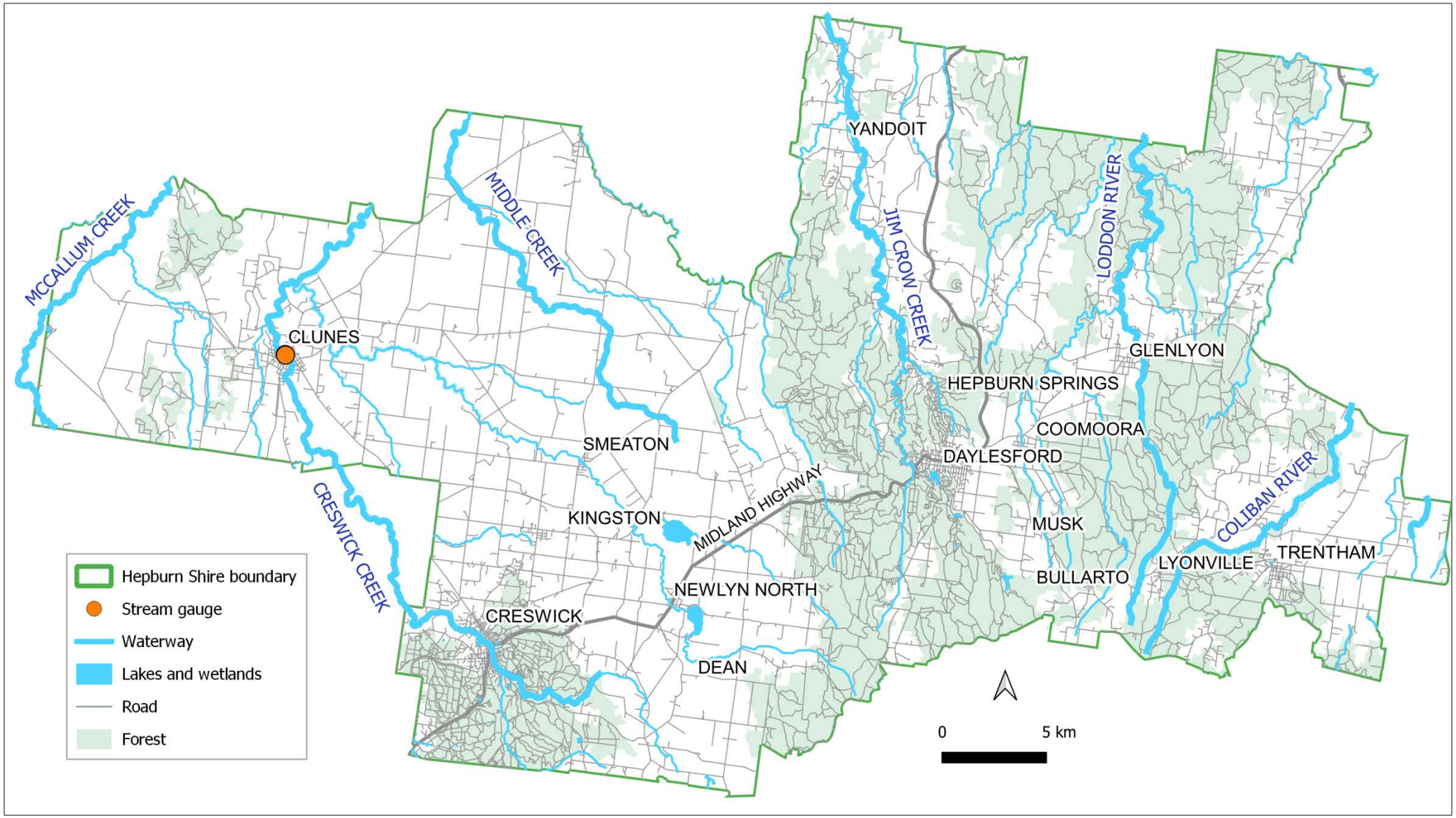
The most recent large flood events were recorded in 2010 and 2011. Refer to Appendix C for a detailed description of historic flood events.

5.2 Major Waterways

The major waterway that causes flooding in towns within Hepburn Shire is listed in the table below.

Waterway	Description
Creswick Creek	Creswick Creek's headwaters begin near Dean, 19km north of Ballarat. Creswick Creek has an approximate catchment area of 85 km^2 upstream of Creswick. Flooding from Creswick Creek significantly impacts Creswick and Clunes. Flooding within Creswick and Clunes is generally associated with rainfall in the upper Creswick Creek catchment generating flows in excess of the creeks capacity through the townships. The capacity of the Creek through these towns is around the 10 year ARI, above which major flooding occurs. Within Creswick tributaries of Creswick Creek, include Slaty Creek, Nuggetty Creek and Spring Gully. Coghills Creek is also a tributary of Creswick Creek located downstream of Creswick. Downstream of Clunes, Creswick Creek's name changes to Tullaroop Creek where it flows into the Tullaroop Reservoir then through Carisbrook before joining the Loddon River at Eddington. Depending on the location and intensity of rainfall within the catchment, the level of Creswick Creek within Clunes can rise suddenly without significant rainfall in the upper catchment. Birches Creek flows into Tullaroop Creek immediately downstream of Clunes.

	A stream gauge is located along Creswick Creek at Clunes. Currently there are no flood class levels for this gauge. A gauge board has been installed in Creswick at the Water Street Bridge, along Creswick Creek to assist to monitoring stream heights during flood event.


MCCALLUM CREEK
MIDDLE CREEK
YANDOIT
JIM CROW CREEK
LODDON RIVER
CLUNES
GLENLYON
HEPBURN SPRINGS
COOMOORA
SMEATON
DAYLESFORD
CRESWICK CREEK
MIDLAND HIGHWAY
COLIBAN RIVER
KINGSTON
MUSK
TRENTHAM
LYONVILLE
BULLARTO
NEWLYN NORTH
CRESWICK
DEAN
Hepburn Shire boundary
Stream gauge
Waterway
Lakes and wetlands
Road
Forest
0
5 km

5.3 Levees and Flood Mitigation Works

The Hepburn Shire has worked closely with the North Central CMA and DELWP to construct a levee in Creswick to provide protection up to a 50 year ARI flood event. Refer to Appendix C for a detailed description of flood mitigation works undertaken in Creswick.

5.4 Building Damages

Refer to the table below for property and building damages for flood events within the Hepburn 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.

Observed rainfall trigger (mm)	Average Recurrence Interval (Annual Exceedance Probability)	Total number of properties flooded (buildings flooded above floor)		Total damages for the Hepburn Shire
		Creswick (Appendix C1)	Clunes (Appendix C2)	
~48 mm in 6 hours	5 (20%)	0 (0)	0 (0)	0 (0)
~56 mm in 6 hours	10 (10%)	22 (0)	0 (0)	22 (0)
~66 mm in 6 hours	20 (5%)	36 (0)	23 (4)	59 (4)
~80 mm in 6 hours	50 (2%)	39 (0)	52 (21)	91 (21)
~92 mm in 6 hours	100 (1%)	138 (51)	70 (44)	208 (95)
~105 mm in 6 hours	200 (0.5%)	147 (84)	76 (57)	223 (141)

Level 2 ICC

Level 3 ICC

5.5 Dams and Lakes

Significant dams and lakes within the Hepburn Shire Council area are listed below. Due to the small size of these dams and lakes, they will have little impact on attenuating the flows and are not likely to contribute to downstream flooding (Water Technology 2012). Modelling undertaken (Water Technology 2012) showed that these dams, even when empty have little impact on downstream flooding. During large flood events they act as weirs, they pass all upstream flows downstream.

Location	Owner	Full Supply volume	Comments
St Georges Lake	Parks Victoria	200 ML	During the January 2011 flood event, there was concern regarding the potential for the St Georges Lake dam wall failure given the high flood flows (in excess of 8,657 ML/d) along Creswick Creek. Since this flood event works have been undertaken to lower the spillway to reduce the risk of the dam wall failure. This Lake is used for recreation.
Cosgrove Reservoir, upstream of Creswick.	Central Highlands Water	680 ML	Water supply storage reservoir that receives water that is pumped from Newlyn Reservoir.
Bullarto Reservoir, near Lyonville along Kangaroo Creek, a tributary of the Loddon River.	Central Highlands Water	219 ML	This water supply reservoir is not likely to contribute to downstream flooding due to its size and location in the upper catchment. During large flood events they do fill and spill, and have little impact on attenuating flood flows. Any flood flows that enter the storage will flow over the spillway.
Hepburn Reservoir, upstream of Hepburn Springs.	Central Highlands Water	45 ML	This water supply reservoir is not likely to contribute to downstream flooding due to its size and location in the upper catchment. During large flood events they do fill and spill, and have little impact on attenuating flood flows. Any flood flows that enter the storage will flow over the spillway.
Wombat Creek Dam, upstream of Daylesford.	Central Highlands Water	586 ML	This water supply is not likely to contribute to downstream flooding due to its size and location in the upper catchment. During large flood events they do fill and spill, and have little impact on attenuating flood flows. Any flood flows that enter the storage will flow over the spillway
Newlyn Reservoir, on Birch Creek, upstream of Newlyn North.	Goulburn Murray Water	3,125 ML	Water supply storage that regulates flow for irrigation, stock and domestic and environmental flow entitlements.

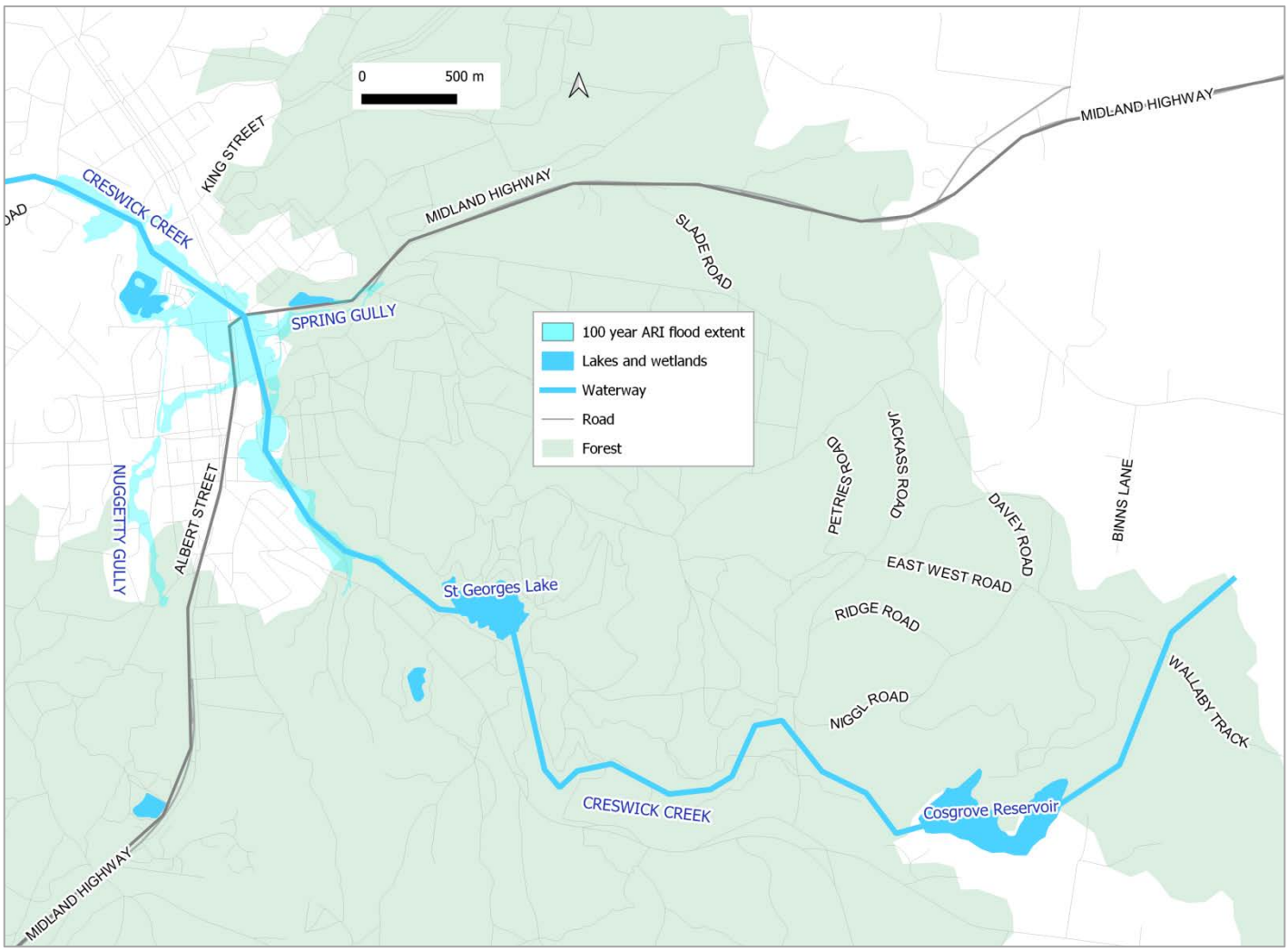
Appendix B: Typical flood peak travel times

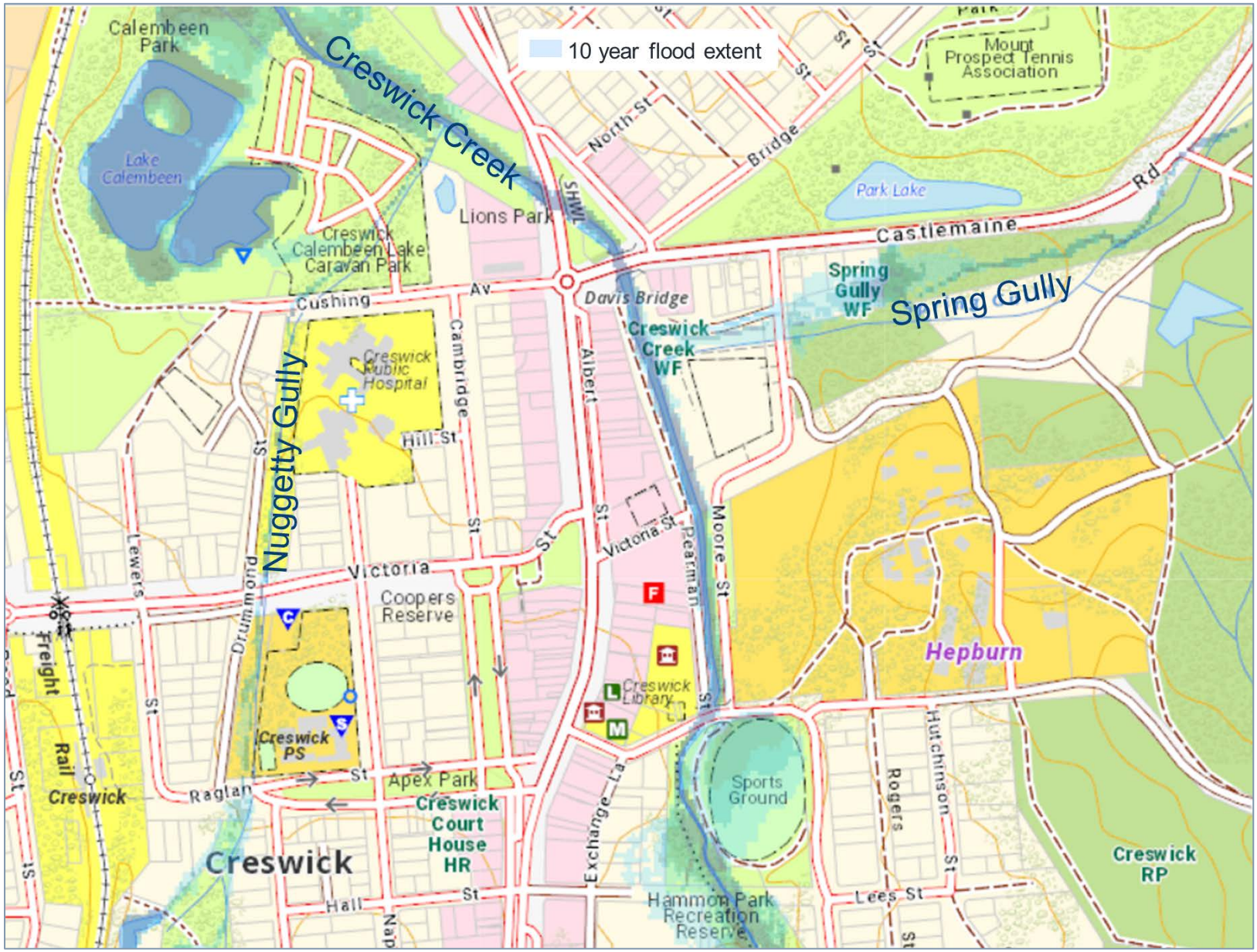
Location From	Location To	Typical Travel Time	Comments	Duration
Creswick (Creswick Creek)				
Localised heavy rainfall	Creswick	30 minutes	Stormwater flood impacts develop quickly	6 hours
Start of rainfall (upper catchment)	Creswick	0.5-5 hours	Begin to rise from normal levels	12 hours
Peak travel time from Spring Gully and Nuggetty Gully	Creswick	2-3 hours	To peak	
Start of rainfall (upper catchment)	Creswick	2-6 hours	To peak	
Clunes (Creswick Creek)				
Localised heavy rainfall	Clunes	30 minutes	Stormwater flood impacts develop quickly	6 hours
Start of rainfall (upper catchment)	Clunes	0.5-6 hours	Begin to rise from normal levels	1 day
Start of rainfall (upper catchment)	Clunes	12-18 hours	to peak	
Peak travel time from Creswick	Clunes	2 - 6 hours	To peak	
Peak travel time from Creswick	Clunes	4 hours	To peak during January 2011	
Peak travel time from Creswick	Clunes	6 hours	To peak during September 2010	

Appendix C1: Creswick (Creswick Creek) Flood Emergency Plan

The main waterway that contributes to flooding in Creswick is Creswick Creek, refer to the maps below. Other smaller tributaries of Creswick Creek include Spring Gully and Nuggetty Gully. Creswick is also prone to stormwater flooding.

Creswick Creek's headwaters begin near Dean, 19 km north east of Ballarat. Creswick Creek runs through Creswick along the eastern side of the Midland Highway and Albert Street. The Creek then crosses beneath the Midland Highway and North Parade before heading north-west through Calembeen Park. The catchment area upstream of Creswick is approximately 85 km^2 (Water Technology 2012).





Creswick Waterways.

Creswick Bowling Club impacted by flooding during the January 2011 event.

Stormwater flooding

Creswick is also prone to stormwater flooding, minor local drainage issues resulting from local intense local storms centred over the town. Creswick experienced a stormwater flooding event in February 2011 where heavy localised rainfall fell across the upper reaches of the gullies near Creswick.

Historic Flood Events

Creswick has been subject to extensive flash flood events, significant flood events have occurred in 1869, 1870, 1889, 1893, 1901, 1909, 1916, 1933, 1975, 2010 and 2011.

Creswick has recently been subjected to flooding from high intensity rainfall events in September 2010 and January 2011. These flood events caused considerable damages to buildings, roads and critical infrastructure. Refer to photos below that demonstrate hazardous flash flooding that occurs along roads within Creswick, refer to flood photos below.

The September 2010 flood in Creswick is estimated to be a 25 year ARI event, and the January 2011 flood is estimated to be a 35 year ARI event.

Rainfall records show that 166 mm of rainfall was recorded over three days during the January 2011 flood event. For the September 2010 flood event, 83.5 mm was recorded to fall over 36 hours.

During the January 2011 and September 2010 flood events the smaller tributaries, Nuggetty Gully and Spring Gully peaked approximately 2-3 hours before Creswick Creek. Floodwater from Spring Gully overtopped Moore Street and inundated units in the Semmens Retirement Village and a few properties along Castlemaine Road. Floodwater from Nuggetty Gully overtopped the bluestone wall along the Creswick Primary School and pooled in the low lying north-east corner of the School field before running down Victoria Street. Some of this floodwater flowed across Albert Street and east towards Creswick Creek while the remaining floodwater travelled north-west towards the low lying area through the Farmers Arms Hotel. Floodwater from Nuggetty Gully had low velocity and low flood depth, and did not last as long as the Creswick Creek peak.

Shortly after floodwater began to breakout at the downstream end of Nuggetty Gully it overtopped the Cushing Avenue-Cambridge Street intersection, inundating Calembeen Park and the low lying areas near the Creswick Motel. This area was inundated primarily from Creswick Creek floodwater backing up Nuggetty Gully. The Nuggetty Gully flood peak passed prior to this area becoming inundated.

In January 2011, Creswick Creek had multiple flood peaks over a four day storm event. Creswick Creek flooded and receded a number of times prior to the largest flood peak. Creswick Creek reached capacity and started to break its banks at North Parade and Calembeen Park. As Creswick Creek continued to rise floodwaters broke out of bank at Hammon Park and the section between Water Street and Castlemaine Road Bridge.

Hammon Park impacted by flooding during the January 2011 flood event.

Water Street Bridge impacted by flooding during the January 2011 flood event.

Creswick Creek also overtopped its banks, flooding properties in Albert Street, North Parade, units in Semmens Retirement Village and Castlemaine Road upstream of the Castlemaine Road Bridge. As Creswick Creek continued to rise floodwaters flowed towards the north-west inundating more properties along Albert Street, Cambridge Street and Cushing Avenue.

Flooding along Cushing Avenue in Creswick during the January 2011 event.

Buildings impacted by flooding along Albert Street in Creswick during the January 2011 event.

Creswick looking south west along Creswick Creek during the September 2010 flood event (NC CMA).

Victoria Street in Creswick impacted by flooding during the January 2011 flood event.

Creswick looking south along Creswick Creek and Clunes Road during the September 2010 flood event (NC CMA).

Creswick looking at the Semmens Court Retirement Village during the September 2010 flood event (NC CMA).

Creswick looking west along Albert Street during the September 2010 flood event (NC CMA).

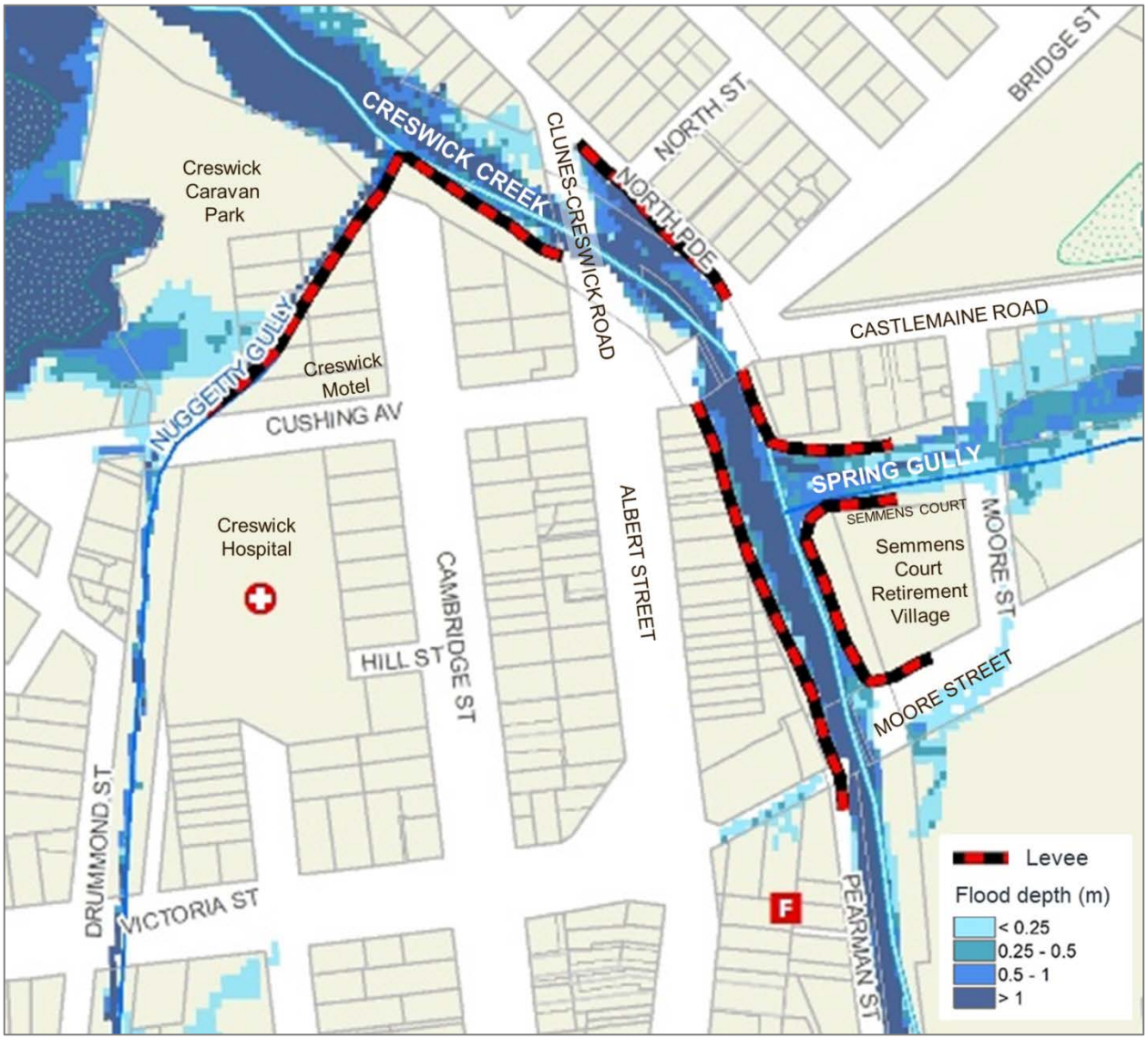
Victoria Street in Creswick impacted by flooding during the September 2010 flood event (source: Laurie McBride).

Levee and Flood Mitigation Works

Extensive flood mitigation works have been undertaken within Creswick to reduce flood risk, costing over $1.4 million. Mitigation works undertaken include;

- Minor Creek deepening and widening between Water Street and Castlemaine Road Bridge and between Clunes Road Bridge and Nuggetty Gully.
- Construction of a levee system in Creswick to protect buildings subject to over floor flooding (refer to levee map below).
- Installation two additional culverts under the Clunes Road and Castlemaine Road Bridges.
- Installation of one way valves on minor drains.

The Hepburn Shire Council has completed the construction of flood protection levees along Creswick Creek, Spring Gully and Nuggetty Gully, refer to the map below. The length of the Creswick levees is approximately 1.26 km. The construction of these levees was completed in 2015. The protection level of the Creswick levees is to a 50 year flood event, there is no additional freeboard. Freeboard is a factor of safety above the design flood level, this tends to compensate for flood prediction uncertainties. The Creswick levee protection level of a 50 year flood event is larger than the January 2011 flood event, estimated to be a 35 year ARI flood event. For flood events larger than a 50 year event, floodwater will overtop these levees. Refer to the Creswick Flood Intelligence Card and maps below for details regarding buildings and roads impacted by flooding.



Creswick levees.

Creswick levee wall, looking upstream from Castlemaine Road.

Creswick levee at the rear of properties along Castlemaine Road.

Infrastructure that Impacts Flooding

The bridges over Creswick Creek at Castlemaine Road and Clunes Road were both shown to restrict the passage of floodwaters. Hepburn Shire Council and Regional Roads Victoria have worked together to construct additional culverts underneath each of these bridges to alleviate this impact.

Close attention during a flood event needs to be paid to these culverts to ensure they are not blocked by debris during a flood event. Consideration needs to be given to having machinery available to remove debris should the need arise, particularly following a prolonged dry period such as occurred in September 2010, when the culverts became blocked with accumulated debris washed down from the upstream waterway. Works within a waterway during a flood is a high risk activity and all due care must be taken to ensure it is conducted safely.

Flood Warning Time

Stormwater flooding in Creswick can develop quickly from heavy localised rainfall in local waterways. Stormwater flood impacts can occur within 30 minutes of rainfall.

Modelling (Water Technology 2012) shows during the September 2010 flood event flood flows peaked in Nuggetty Gully at 4am, Spring Gully at 4:30am and Creswick Creek at 7am, refer to the table below. Anecdotal evidence indicated that flooding was present in Creswick until 4pm. Refer to the table and hydrographs below showing the timing of the flood peaks for historic flood events in Creswick and Clunes.

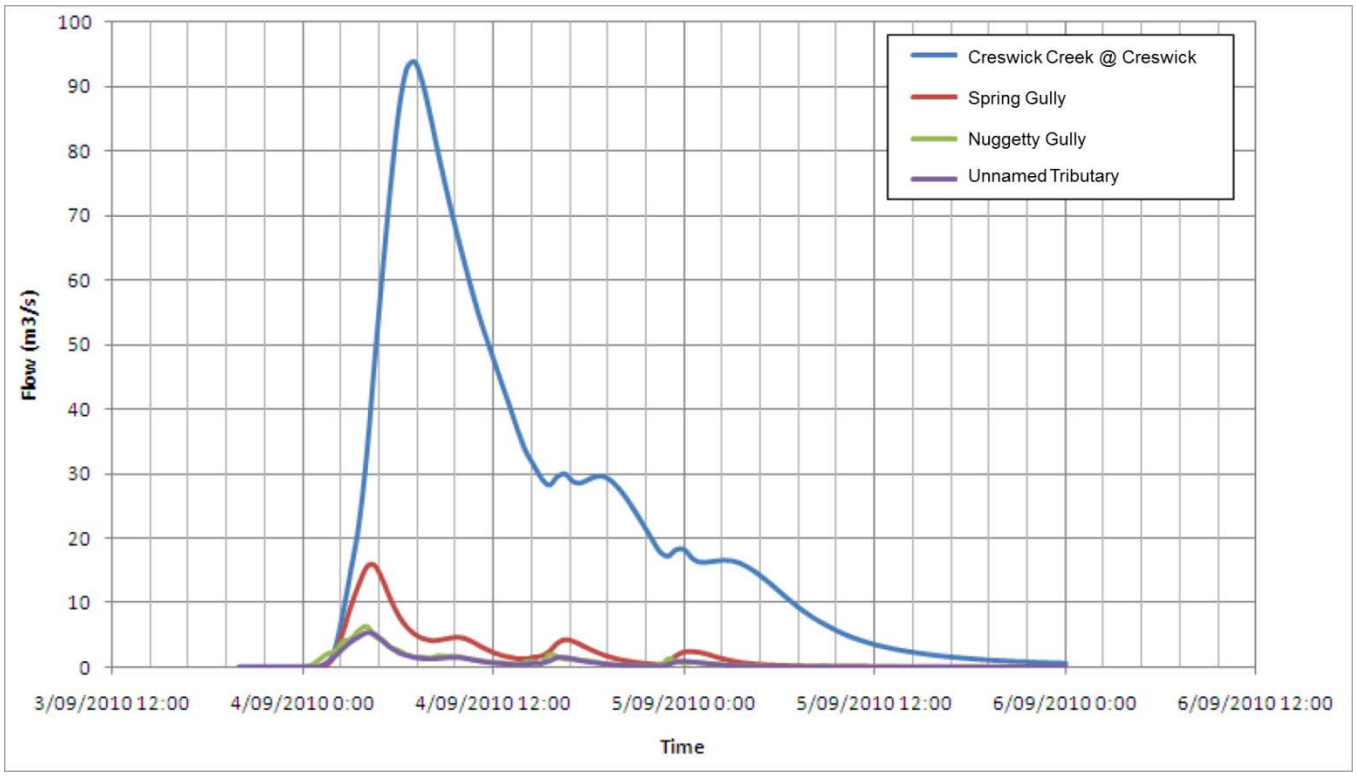
Rapid rises in floodwater in local waterways and Creswick Creek can occur within 0.5-5 hours from rainfall. The floodwater peak may occur within 2-6 hours from rainfall.

Location	4th of September 2010 (rainfall started 9:00 pm on the 3rd, 83.5mm over 1.5 days)		14th of January 2011 (rainfall started 10:30 am on the 11th, 166mm over 3 days)	
	Modelled Peak Flow (ML/d)	Modelled Peak Time	Modelled Peak Flow (ML/d)	Modelled Peak Time
Nuggetty Gully	552	4:00 am	475	8:00 am
Unnamed Tributary	466	4:00 am	449	8:00 am
Spring Gully	1,365	4:30 am	1,330	8:30 am
Creswick Creek @ Creswick	8,104	7:00 am	8,657	10:30 am

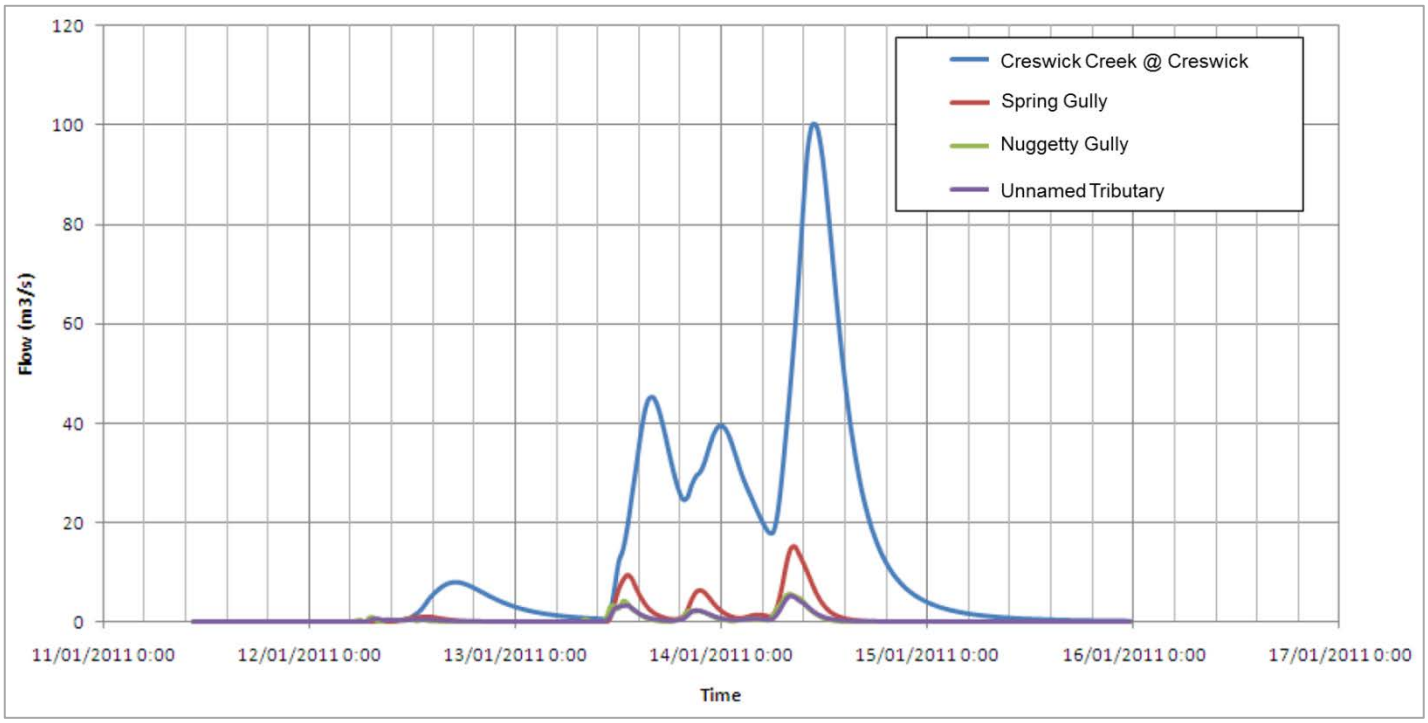
It is important to note that the time it takes rainfall associated with severe thunderstorm activity to develop into runoff is highly dependent on antecedent conditions, the saturation of the catchment. A flood on a 'dry' waterway travels more slowly than a flood on a 'wet' waterway. Also large floods tend to travel faster than small floods. 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.

There are no local stream gauges that provide flood warning for Creswick. Gauge boards have been installed at the Water Street Bridge, they can be used to monitor flood heights within Creswick during flood events.

Due to the short warning time available, it's important that VICSES and other agencies take action to door knock houses with high flood risk when heavy rainfall events are predicted that may lead to flooding.



Modelled flood flows in Creswick waterways during the September 2010 flood event (Water Technology 2012).



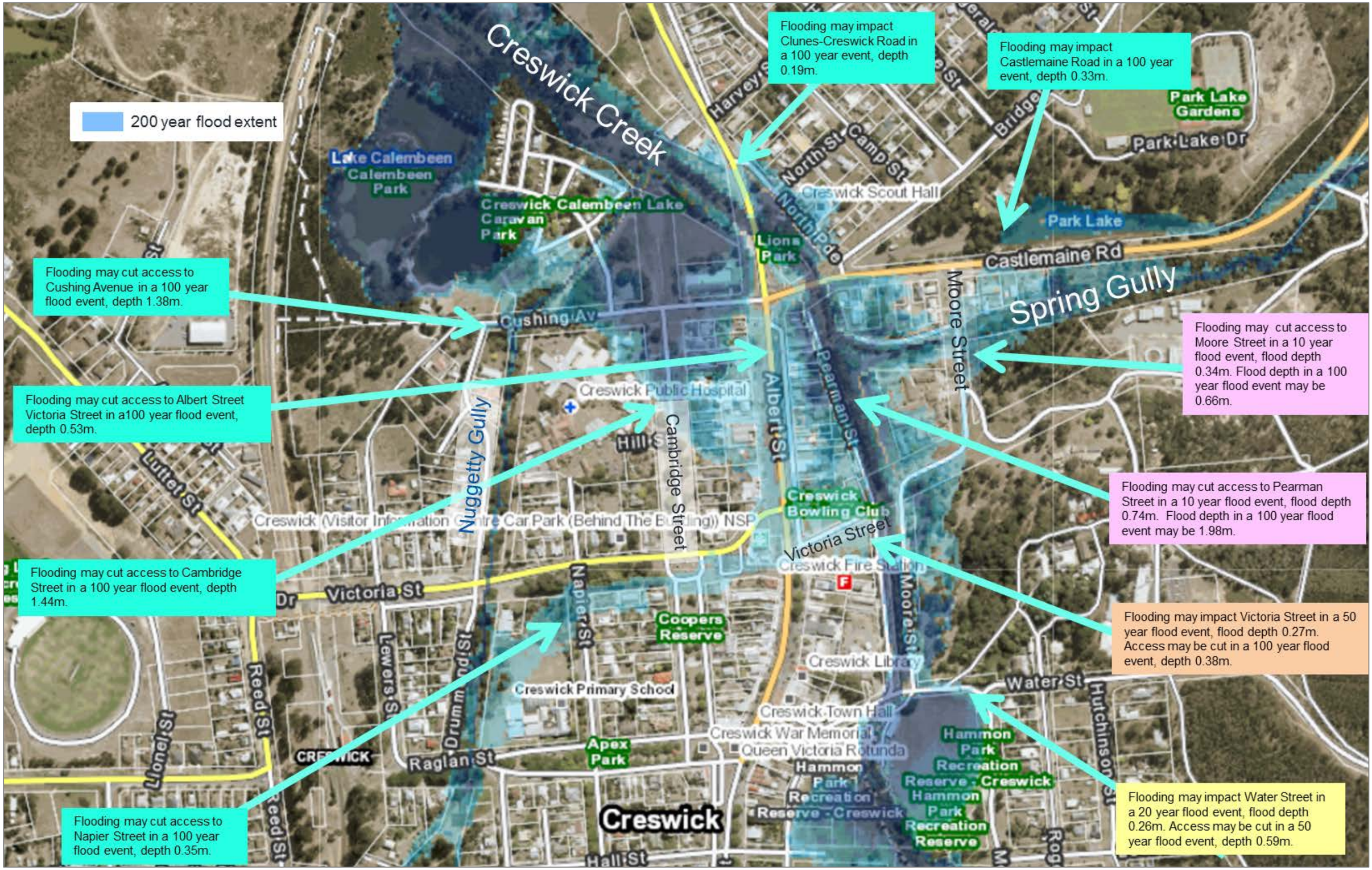
Modelled flood flows in Creswick waterways during the January 2011 flood event (Water Technology 2012).

Flood Impacts and Actions Required

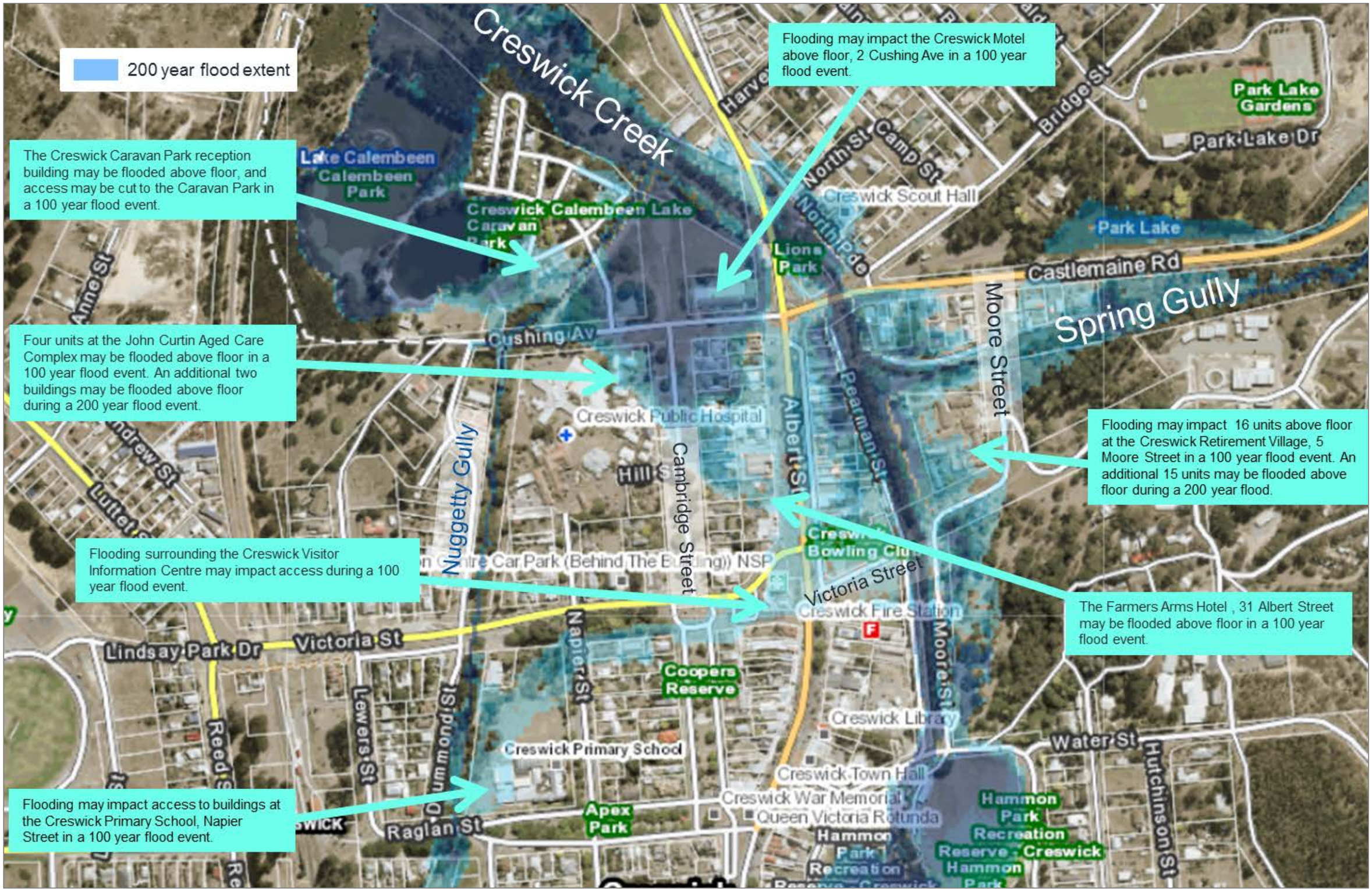
Key assets at risk of flooding in Creswick are listed in the table below.

Asset register				
Asset Name and location	**Average Recurrence Interval (Annual Exceedance Probability)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
Hammon Park Oval,	5 year flood (20% AEP)	Shallow flooding starts to impact the Hammon Park Oval	Notify the management committee.	Council
Moore Street, Creswick.	10 year flood (10% AEP)	Flooding may cut access/egress to Moore Street in a 10 year flood, depth 0.34 m. Flood depth in 100 year flood event may be 0.66 m	Evacuate Moore Street residents of the Creswick Retirement Village as needed Deploy road closure signs and undertake traffic management as needed.	Victoria Police Council
Victoria Street, Creswick.	50 year flood (2% AEP)	Flooding may impact Victoria Street in a 50 year flood event, depth 0.27 m. Access may be cut in a 100 year flood, depth 0.38 m.	Deploy road closure signs and undertake traffic management as needed.	Council
Water Street, Creswick.	50 year flood (2% AEP)	Flooding may impact Victoria Street in a 50 year flood event, depth 0.26m. Access may be cut in a 100 year flood, depth 0.52 m.	Deploy road closure signs and undertake traffic management as needed.	Council
51 buildings are flooded over floor, refer to the Intelligence Card and damages maps below for locations.	100 year flood (2% AEP)	15 buildings are flooded above floor in a 100 year flood event.	Evacuate residents of the Creswick Motel as needed.	Victoria Police
Cushing Avenue, Creswick.	100 year flood (1% AEP)	Flooding may cut access/egress to Cushing Avenue in a 100 year flood, depth 1.38 m.	Deploy road closure signs and undertake traffic management as needed.	Council
Albert Street, Creswick.	100 year flood (1% AEP)	Flooding may cut access/egress to Albert Street, in a 100 year flood, depth 0.53 m.	Deploy road closure signs and undertake traffic management as needed.	Council
Creswick Primary School, Napier Street.	100 year flood (1% AEP)	Flooding may impact access to buildings to the east of the Creswick Primary School, adjacent to Nuggetty Gully.	Evacuate the Creswick Primary School as needed.	Victoria Police
16 units at the Creswick Retirement Village, 5 Moore Street	100 year flood (1% AEP)	16 units at the Creswick Retirement Village may be flooded above floor.	Evacuate residents of these units as needed. Council relief Centre will be opened as needed.	Victoria Police Council
Creswick Caravan Park, 12 Cushing Avenue	100 year flood (1% AEP)	The Creswick Caravan Park reception building may be flooded above floor, and access may be cut to the Caravan Park.	Evacuate residents of the Creswick Caravan Park as needed.	Victoria Police
Creswick Motel, 2 Cushing Avenue.	100 year flood (1% AEP)	The Creswick Motel may be flooded above floor.	Evacuate the Creswick Motel as needed.	Victoria Police
Farmers Arms Hotel, 31 Albert Street.	100 year flood (1% AEP)	The Farmers Arms Hotel may be flooded above floor.	Evacuate the Hotel as needed.	Victoria Police
John Curtin Aged Care buildings, 11-15 Cambridge Street.	100 year flood (1% AEP)	4 units at the John Curtin Aged Care Complex may be flooded above floor.	Evacuate residents of these units as needed. Council relief Centre will be opened as needed.	Victoria Police Council
15 units at the Creswick Retirement Village, 5 Moore Street	200 year flood (0.5% AEP)	15 units at the Creswick Retirement Village may be flooded above floor.	Evacuate residents of these units as needed. Council relief Centre will be opened as needed.	Victoria Police Council
John Curtin Aged Care buildings, 17 Cambridge Street.	200 year flood (0.5% AEP)	2 units at the John Curtin Aged Care Complex may be flooded above floor.	Evacuate residents of these units. Council relief Centre will be opened as needed.	Victoria Police Council

For more detailed information regarding buildings and roads impacted refer to the Creswick Flood Intelligence Card and flood impact maps below. Also refer to the Creswick flood depth maps in **Appendix F**, and a list of flood observers in **Appendix H**.



Creswick roads impacted by flooding with the 100 year flood extent (Water Technology 2012).

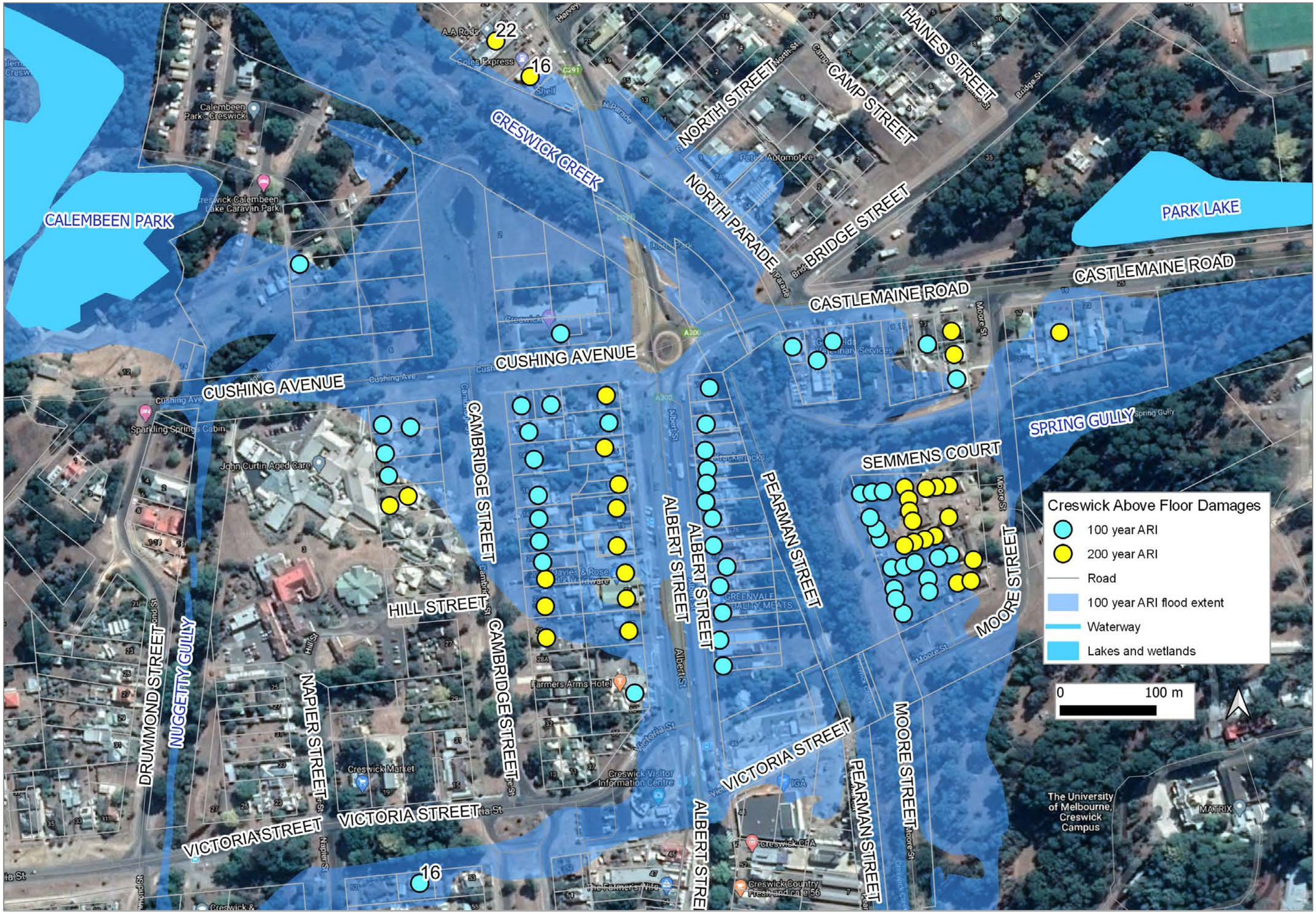


Creswick assets impacted by flooding over the 100 year ARI flood extent.

Creswick Flood Intelligence Card

Flood travel time						Time from start of rain to steep rise in floodwater 0.5 - 5 hours Time from start of rainfall to flood peak 2 - 6 hours Riverine flooding duration: 12 hours		
Observed rainfall (mm)	**Creswick Creek at Creswick (Water Street) gauge board height (m)** doesn't provide flood warning	**Average Recurrence Interval (Annual Exceedance Probability) (Water Technology 2012)**	**Creswick Creek Design Flows (ML/d)**	**Creswick damages total number properties flooded (above floor) with the levee constructed**	**Consequences/ Impact (Water Technology 2012)**	**Houses/ buildings flooded / isolated**	**Roads Impacted**	**Action**
48 mm of rain in 6 hours	2.53 m	Minor flood level 5 year event (20% AEP)	2,938	0 (0)	Water levels reach the top of bank in Creswick Creek and spill out in low lying areas at Calembeen Park and Hammon Park Oval. Shallow overland depths with no properties affected above floor level. Spring Gully and Nuggetty Gully overflows cause minor inundation of low lying areas. Close attention needs to be paid to culverts along Creswick Creek at Castlemaine Road and Clunes Roads.		Albert Street depth 0m Castlemaine Road depth 0m Cushing Avenue depth 0m Clunes-Creswick Road depth 0m Water Street depth 0m North Parade depth 0m Cambridge Street depth 0m	VICSES activate CFA ground observers to take photos and record flood levels at key crossings. Council and Regional Roads Victoria to deploy road closure signs and undertake traffic management as needed.
56 mm of rain in 6 hours	3.46 m	Moderate flood level 10 year event (10% AEP)	4,847	22 (0)	Floodwaters overtop the banks of Creswick Creek, between Water Street and Castlemaine Road, and start to encroach on properties. Floodwaters overtop Creswick Creek banks between Water Street and Castlemaine Road. Floodwaters from Creswick Creek back up Nuggetty Gully, flooding Cushing Avenue and a few properties south of Cushing Avenue.		Albert Street depth 0m Castlemaine Road depth 0m Cushing Avenue depth 0m Clunes-Creswick Road depth 0m Moore Street depth 0.34m Water Street depth 0.04m North Parade depth 0m Cambridge Street depth 0m	Refer to actions listed above.
66 mm of rain in 6 hours	4.48 m	Major flood level 20 year event (5% AEP)	7,275	36 (0)	Nuggetty Gully may overtop bluestone wall at school, but impact is minimal.		Albert Street depth 0m Castlemaine Road depth 0m Cushing Avenue depth 0m Clunes-Creswick Road depth 0m Moore Street depth 0.46m Water Street depth 0.26m North Parade depth 0m Cambridge Street depth 0m	In addition to actions listed above: Council monitor the levees, culverts and one-way valves to check if they are operating. Council clear debris from waterway crossings, drains and culverts as needed.
83.5 mm over 36 hours		September 2010 25 year flood (4% AEP)		? (90)	Culverts were blocked with accumulated debris washed down from upstream waterway. Roads cut isolating parts of Creswick residences and businesses flooded People were trapped in vehicles. Buildings sustained major damage. Approximately 90 buildings were flooded over floor, including homes, businesses, six units in Semmens Village, the Creswick Motel, the football oval and clubrooms, a dental surgery, the Creswick Bowling club, part of the Creswick Caravan Park, and the Creswick Primary School (Napier Street). Water overtopped the Castlemaine Road Bridge, restricting access via the Midland Highway.			
166 mm over 3 days		January 2011 35 year flood		? (90)	Roads cut isolating parts of Creswick residences and businesses flooded. People were trapped in vehicles. Buildings sustained major damage. Flood depths were slightly deeper than the September 2010 flood event. Approximately 90 buildings were flooded over floor, including homes, businesses, six units in Semmens Village, the Creswick Motel, the football oval and clubrooms, a dental surgery, the Creswick Bowling club, part of the Creswick Caravan Park, and the Creswick Primary School (Napier Street). Water overtopped the Castlemaine Road Bridge, restricting access via the Midland Highway			
80 mm of rain in 6 hours	6.67 m	50 (2% AEP)	11,180	39 (0)	Floodwaters will reach the top of the flood walls/levees and may overtop these structures. If overtopping occurs, refer to damages listed for the 100 year flood event below.		Albert Street depth 0m Castlemaine Road depth 0m Cushing Avenue depth 0m Clunes-Creswick Road depth 0m Moore Street depth 0.60m Water Street depth 0.59m North Parade depth 0m Cambridge Street depth 0m	In addition to actions listed above: Victoria Police evacuate buildings as needed before people are isolated.

92 mm of rain in 6 hours	7.10 m	100 (1% AEP)	14,446	138 (51)	The flood extent has significantly increased due to the levees being overtopped. 51 buildings may be flooded over floor, they include; 16 units at the Creswick Retirement Village (5 Moore Street), the Creswick Motel (2 Cushing Ave), buildings at the Creswick Caravan Park (12 Cushing Ave), x4 units at the Cambridge Street John Curtin Aged Care Complex, the Farmers Arms Hotel (31 Albert Street). Flooding may also impact access to buildings at the Creswick Primary School (Napier Street) and the Creswick Visitor Information Centre.	Access is cut to the Creswick Caravan Park. Creswick Primary School may be impacted by flooding. 51 buildings that are flooded above floor: Creswick Motel (2 Cushing Avenue), Creswick Caravan Park Reception (12 Cushing Avenue), x16 Creswick Retirement Village units, Semmens Court (1, 2, 3, 4, 5, 6, 7, 8, 14, 15, 27, 28, 29, 30, 31, 32), X4 units John Curtin Aged Care Complex, Cambridge Street (L/11, J/13, K/13, I/15), x15 Albert Street (10, 13, 14, 16, 18, 20, 22, 24, 26, 28, 30, 31, 34, 36, 38), x6 Cambridge Street (12, 14, 16, 16A, 18, 20), x5 Castlemaine Road (1, 3, 5, 13, 3/15), x2 Cushing Avenue (1, 3), 16 Victoria Street.	Albert Street depth 0.53m Castlemaine Road depth 0.33m Cushing Avenue depth 1.38m Clunes-Creswick Road depth 0.19m Moore Street depth 0.66m Water Street depth 0.86m North Parade depth 0.83m Cambridge Street depth 1.44m	In addition to actions listed above: Victoria Police evacuate buildings as needed.
105 mm of rain in 6 hours	7.62 m	200 (0.5% AEP)	18,101	147 (84)	The flood extent has not increased significantly, 33 additional buildings are flooded over flood, these include; 15 units at the Creswick Retirement Village (5 Moore Street) and two units at the Cambridge Street John Curtin Aged Care Complex.	33 additional buildings that are flooded above floor: x15 Creswick Retirement Village units, Semmens Court (9, 10, 11, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26 and the Community Centre), x8 Albert Street (11, 15, 17, 19, 21, 23, 25, 27), x3 Castlemaine Road (1/15, 2/15, 19), x3 Cambridge Street (20A, 22, 26), x2 Clunes Road (16, 22), x2 Creswick Retirement Village units in Cambridge Street (G/17, H/17).		Refer to actions listed above.



Creswick above floor building damages for a range of design flood events (Water Technology 2012).

Creswick above floor building damages for a range of design flood events (Water Technology 2012).

Creswick Property Inundation Table (Water Technology 2012)

Colours used in the property table below are the same used in the Creswick above floor building damages map above. Blue, buildings flooded above floor in a 100 year ARI flood event. Yellow, buildings flooded above floor in a 200 year ARI flood event.

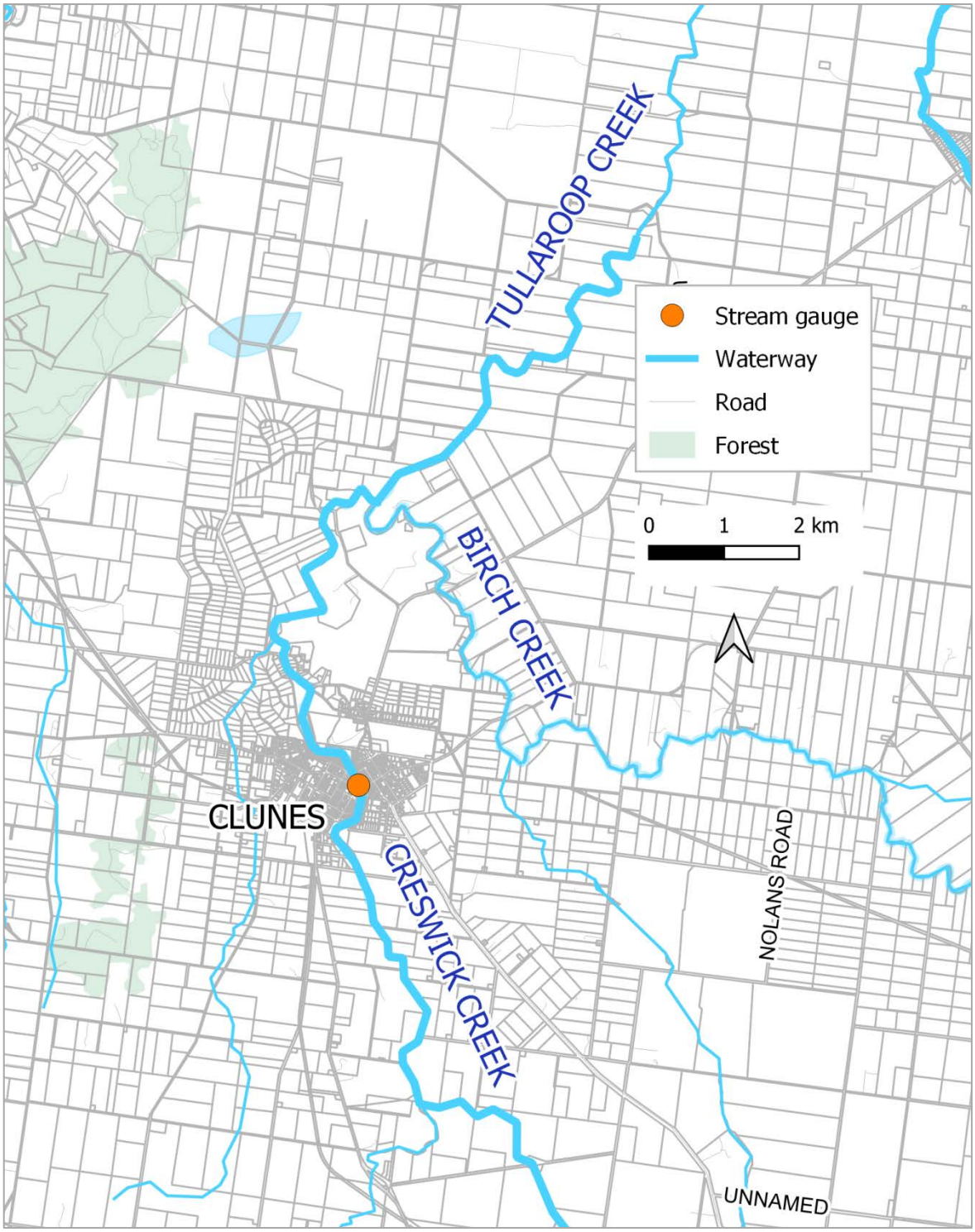
No	Address	Depth of building over-floor flooding for each ARI event (m)	
		100	200
1	1 Cushing Avenue Creswick	0.92	1.40
2	Creswick Motel, 2 Cushing Avenue Creswick	0.92	1.33
3	3 Cushing Avenue Creswick	0.89	1.27
4	10 Albert Street Creswick	0.76	1.08
5	14 Albert Street Creswick	0.68	1.00
6	18 Albert Street Creswick	0.64	0.97
7	Farmers Arms Hotel, 31 Albert Street Creswick	0.63	0.66
8	20 Albert Street Creswick	0.53	0.84
9	22 Albert Street Creswick	0.52	0.83
10	L/11 Cambridge Street Creswick	0.48	0.88
11	24 Albert Street Creswick	0.43	0.76
12	3 Semmens Village Creswick	0.41	0.73
13	12 Cambridge Street Creswick	0.41	0.91
14	J/13 Cambridge Street Creswick	0.41	0.81
15	1 Semmens Village Creswick	0.38	0.75
16	K/13 Cambridge Street Creswick	0.37	0.76
17	2 Semmens Village Creswick	0.37	0.71
18	26 Albert Street Creswick	0.36	0.69
19	28 Albert Street Creswick	0.34	0.70
20	14 Cambridge Street Creswick	0.32	0.75
21	4 Semmens Village Creswick	0.27	0.57
22	30 Albert Street Creswick	0.26	0.62
23	8 Semmens Village Creswick	0.24	0.62
24	7 Semmens Village Creswick	0.24	0.61
25	6 Semmens Village Creswick	0.23	0.58
26	5 Semmens Village Creswick	0.23	0.56
27	I/15 Cambridge Street Creswick	0.21	0.62
28	1 Castlemaine Road Creswick	0.20	0.40
29	3 Castlemaine Road Creswick	0.20	0.40
30	34 Albert Street Creswick	0.20	0.56
31	16 Cambridge Street Creswick	0.20	0.61
32	16A Cambridge Street Creswick	0.19	0.63
33	5 Castlemaine Road Creswick	0.18	0.38
34	36 Albert Street Creswick	0.16	0.55
35	13 Castlemaine Road Creswick	0.15	0.46
36	13 Albert Street Creswick	0.11	0.32
37	38 Albert Street Creswick	0.08	0.46
38	3/15 Castlemaine Road Creswick	0.08	0.28

No	Address	Depth of building over-floor flooding for each ARI event (m)	
		100	200
39	29 Semmens Village Creswick	0.08	0.27
40	28 Semmens Village Creswick	0.08	0.30
41	30 Semmens Village Creswick	0.08	0.26
42	32 Semmens Village Creswick	0.07	0.26
43	27 Semmens Village Creswick	0.07	0.33
44	18 Cambridge Street Creswick	0.07	0.54
45	31 Semmens Village Creswick	0.06	0.25
46	20 Cambridge Street Creswick	0.06	0.55
47	Caravan Park Reception	0.04	0.41
48	15 Semmens Village Creswick	0.04	0.39
49	14 Semmens Village Creswick	0.02	0.38
50	16 Victoria Street Creswick	0.01	0.15
51	16 Albert Street Creswick	0.003	0.30
52	1/15 Castlemaine Road Creswick		0.67
53	G/17 Cambridge Street Creswick		0.56
54	H/17 Cambridge Street Creswick		0.49
55	9 Semmens Village Creswick		0.38
56	20A Cambridge Street Creswick		0.37
57	22 Cambridge Street Creswick		0.34
58	2/15 Castlemaine Road Creswick		0.33
59	23 Albert Street Creswick		0.32
60	24 Semmens Village Creswick		0.31
61	26 Cambridge Street Creswick		0.31
62	23 Semmens Village Creswick		0.30
63	25 Semmens Village Creswick		0.30
64	26 Semmens Village Creswick		0.27
65	11 Albert Street Creswick		0.26
66	22 Semmens Village Creswick		0.26
67	27 Albert Street Creswick		0.23
68	16 Clunes Road Creswick		0.22
69	21 Semmens Village Creswick		0.22
70	25 Albert Street Creswick		0.22
71	20 Semmens Village Creswick		0.20
72	19 Semmens Village Creswick		0.18
73	17 Albert Street Creswick		0.16
74	10 Semmens Village Creswick		0.12
75	16 Semmens Village Creswick		0.11
76	15 Albert Street Creswick		0.07
77	21 Albert Street Creswick		0.06
78	17 Semmens Village Creswick		0.06
79	22 Clunes Road Creswick		0.06
80	18 Semmens Village Creswick		0.06
81	19 Castlemaine Road Creswick		0.06

No	Address	Depth of building over-floor flooding for each ARI event (m)	
		100	200
82	19 Albert Street Creswick		0.05
83	Community Centre Semmens Village		0.03
84	11 Semmens Village Creswick		0.01

Appendix C2: Clunes (Creswick Creek) Flood Emergency Plan

Clunes is located north of the Great Dividing Range, approximately 20 km north of Creswick. Clunes is subject to flooding from stormwater and riverine flooding. The main waterway that contributes to flooding in Clunes is Creswick Creek, refer to map below. Downstream of Clunes, Creswick Creek becomes Tullaroop Creek.



Historic Flood Events

Clunes has been subject to extensive flash flood events, significant flood events have occurred in 1869, 1870, 1889, 1893, 1901, 1909, 1916, 1933, 1975, 2010 and 2011.

Clunes has recently been subjected to flooding from high intensity rainfall events in September 2010 and January 2011. These flood events caused considerable damages to buildings, roads and critical infrastructure. Refer to photos below that demonstrate hazardous flash flooding that occurs along roads within Clunes, refer to flood photos below.

The September 2010 flood in Clunes is estimated to be a 25 year ARI event, and the January 2011 flood is estimated to be a 40 year ARI event.

Rainfall records show that 166 mm of rainfall was recorded over three days during the January 2011 flood event. For the September 2010 flood event, 83.5 mm was recorded to fall over 36 hours.

During the January 2011 and September 2010, floodwater breakouts initially occurred on the right bank downstream of the Bull Milligan Oval and also upstream of Service Street. As floodwaters continued to rise, the Oval started to flood. The first few properties inundated were the low lying properties near Camp Street and the single property at 1A Cameron Street (location of the old butter factory).

As Creswick Creek flood levels rose further, floodwater impacted the Caravan Park, completely inundating Purcell Street. Floodwaters also overtopped Ligar Street on the right bank and inundated a Swimming Pool building and nearby properties. Fraser Street was also inundated at the lower end, near Camp Street. The Clunes Bowling Club in Ligar Street was inundated. Floodwaters also impacted the main part of Fraser Street encroaching on the commercial buildings along Fraser Street.

Flood Warning Time

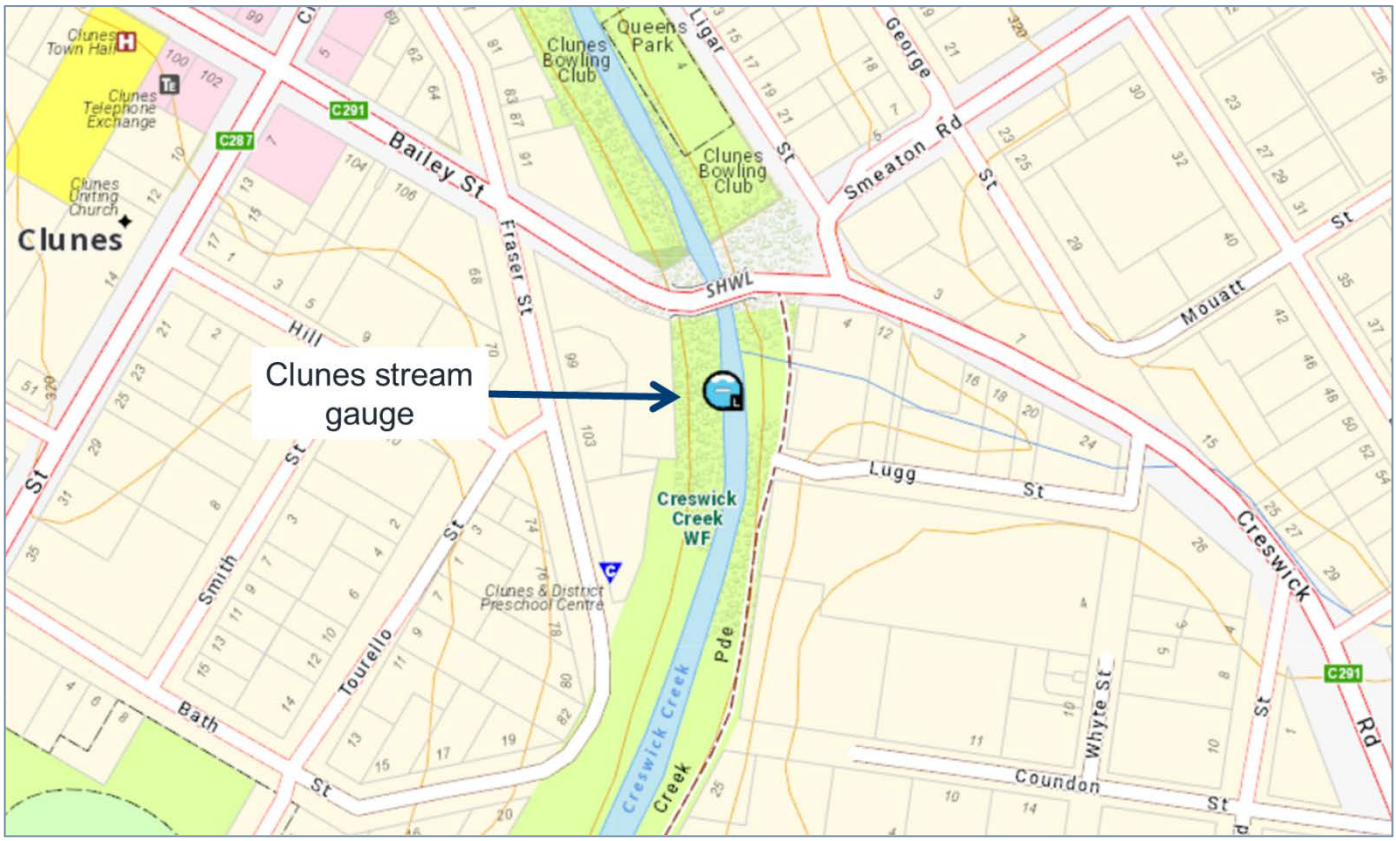
Stormwater flooding can develop quickly in Clunes from heavy localised rainfall in local waterways. Stormwater flood impacts can occur within 30 minutes of rainfall.

Rapid rises in floodwater in local waterways and Creswick Creek can occur within 0.5-6 hours from rainfall. The floodwater peak may occur within 12-18 hours from rainfall. Refer to and hydrographs below showing the timing of the flood peaks for historic flood events in Clunes.

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 travels more slowly than a flood on a ‘wet’ waterway. Also large floods tend to travel faster than small floods. 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.

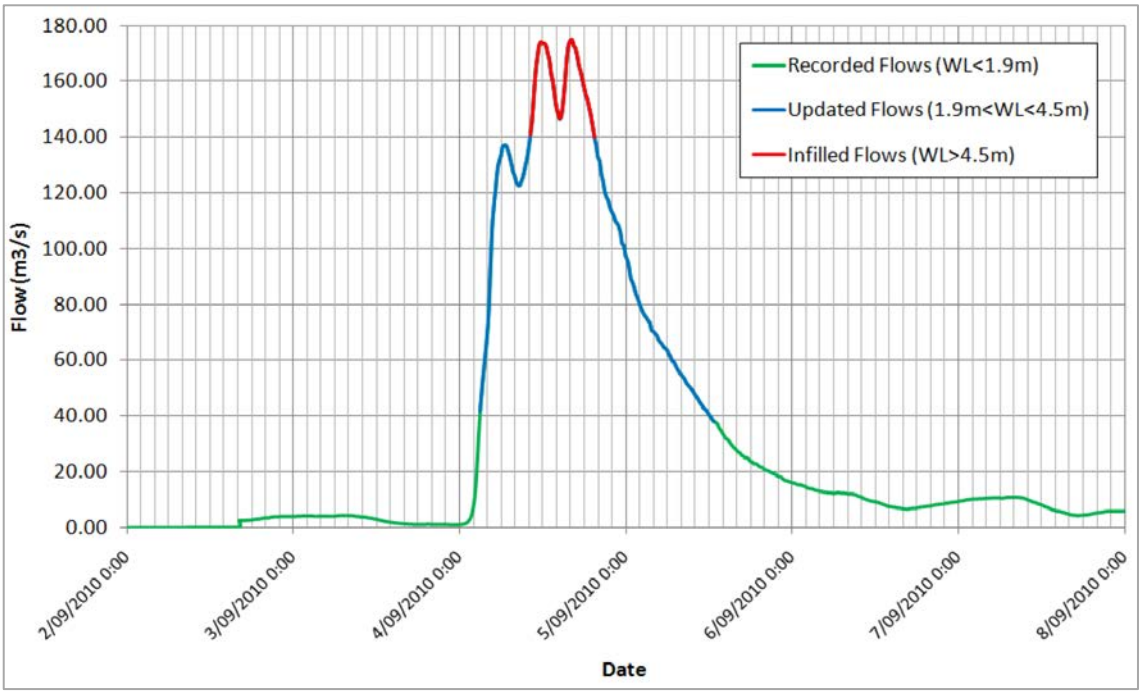
The flood peak travel time between Creswick and Clunes can vary dramatically depending on where the rain falls in the catchment, the intensity and duration of rainfall, typically between 2-6 hours. During January 2011 event the peak travel time was 4 hours and during the September 2010 flood the travel time was 6 hours.

A stream gauge located along Creswick Creek, upstream of the Bailey Street/Creswick Road Bridge provides flood warning for Clunes. Refer to the map below for the gauge location.

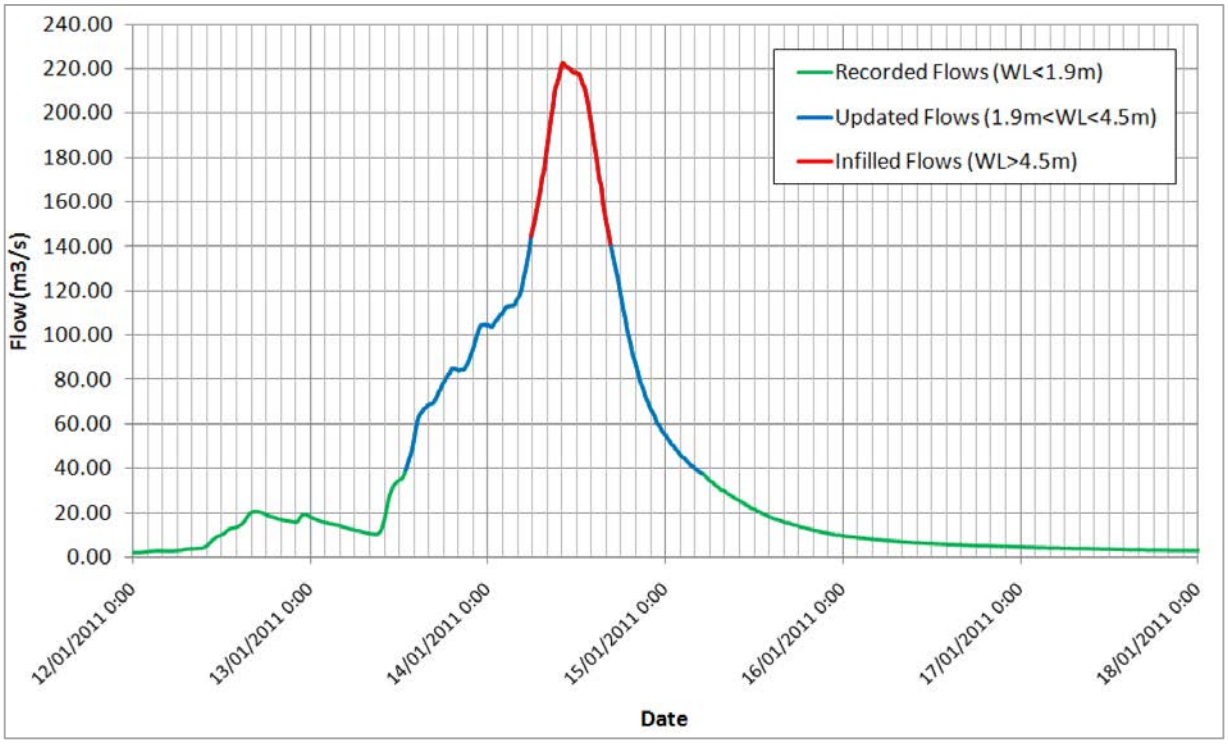


Clunes stream gauge location.

Due to the short warning time available, it's important that VICSES and other agencies take action to door knock houses with high flood risk when heavy rainfall events are predicted that may lead to flooding.



Flows in Clunes at the Creswick Creek gauge during the September 2010 flood event (Water Technology 2012).



Flows in Clunes at the Creswick Creek gauge during the January 2011 flood event (Water Technology 2012).

Clunes Flood Impacts and Required Actions

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

Asset register				
Asset Name and location	**Average Recurrence Interval (Annual Exceedance Probability)**	**Consequence / Impact**	**Mitigation/ Action**	**Lead Agency**
The Bull Milligan Oval, Ligar Street, Clunes.	20 year flood (5% AEP)	The Bull Milligan Oval in Ligar Street may be impacted by flooding in a 20 year flood, depth 0.57 m.	Evacuate as needed.	Victoria Police
Building at the Clunes Swimming Pool, Ligar Street, Clunes	20 year flood (5% AEP)	The Clunes Swimming Pool chemical storage building may be flooded above floor in a 20 year flood event.	Notify the Pool managers to raise all chemicals above the flood level.	VICSES
Clunes Caravan Park, 17 Purcell Street, Clunes	20 year flood (5% AEP)	Flooding may impact the Clunes Caravan Park grounds in a 20 year flood, depth up to 0.40 m. Two buildings are flooded over floor in a 50 year flood.	Evacuate the Caravan Park as needed.	Victoria Police
Fraser Street, adjacent to Creswick Creek, Clunes	20 year flood (5% AEP)	Flooding may cut access to Fraser Street in a 20 year flood event, depth 0.27 m.	Deploy road closure signs as needed.	Council
West Parade, adjacent to Creswick Creek, Clunes	20 year flood (5% AEP)	Flooding may cut access to West Parade in a 20 year flood event, depth 0.33 m.	Deploy road closure signs as needed.	Council
Purcell Street, adjacent to Creswick Creek, Clunes	20 year flood (5% AEP)	Flooding may cut access to Purcell Street in a 20 year flood event, depth 0.32m.	Deploy road closure signs as needed.	Council
All residents in Purcell Street and West Parade, Clunes.	20 year flood (5% AEP)	Access may be cut to all buildings in Purcell Street and West Parade in a 20 year flood event, depth 0.33 m or greater.	Evacuate residents as needed.	Victoria Police
Clunes Bowling Club, 4 Ligar Street, Clunes.	50 year flood (2% AEP)	A bowling green at the Clunes Bowling Club may be inundated in a 50 year flood event.	Notify the Clunes Bowling Club managers to raise all chemicals above the flood level.	VICSES
Ligar Street, adjacent to Creswick Creek, Clunes	50 year flood (5% AEP)	Flooding may cut access to Ligar Street in a 50 year flood event, depth 0.35 m.	Deploy road closure signs as needed.	Council
Clunes-Campbelltown Road/Angus Street, adjacent to Creswick Creek, Clunes	50 year flood (5% AEP)	Flooding may cut access to Clunes-Campbelltown Road/Angus Street in a 50 year flood event, depth 0.50 m.	Deploy road closure signs and undertake traffic management as needed.	Council
The Clunes Library, 53 Fraser Street, Clunes.	100 year flood (5% AEP)	The Clunes Library may be flooded above floor in a 100 year flood event.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
A building at the rear of the National Hotel, 35 Fraser Street, Clunes.	100 year flood (1% AEP)	A building at the rear of the National Hotel may be flooded above floor in a 100 year flood event.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police
Clunes Pharmacy and Post Office, 59 Fraser Street, Clunes	100 year flood (1% AEP)	The Clunes Pharmacy and Post Office may be flooded above floor in a 100 year flood event.	Sandbag buildings and undertake evacuations as needed.	VICSES Victoria Police
The Clunes Senior Citizens Centre, 25 Fraser Street, Clunes.	200 year flood (0.5% AEP)	The Clunes Senior Citizens Centre may be flooded above floor in a 200 year flood event.	Sandbag building and undertake evacuations as needed.	VICSES Victoria Police

For more detailed information regarding buildings and roads impacted refer to the Clunes Flood Intelligence Card and flood damages/impact maps below. Also refer to the Clunes flood depth maps in **Appendix F** and a list of flood observers in **Appendix H**.

Clunes assets impacted by flooding with the 200 year flood extent (Water Technology 2012).

Clunes roads impacted by flooding with the 200 year flood extent (Water Technology 2012).

Clunes Flood Intelligence Card (Water Technology 2012)

Flood travel time	Time from start of rain to steep rise in floodwater 0.5 - 6 hours Time from start of rainfall to flood peak 12 - 18 hours Time between Creswick to Clunes peak 2 - 6 hours Riverine flooding duration: 1 day

Observed rainfall (mm)	Creswick Creek at Clunes gauge height 407214 (m)	Average Recurrence Interval (Annual Exceedance Probability)	Creswick Creek at Clunes Design Flows (ML/d)	Clunes damages total number properties flooded (above floor)	Consequence / Impact	Houses/ buildings flooded / isolated	Roads Impacted	Action
~48 mm in 6 hours	2.53	5 (20%)	4,590	0 (0)	Contained within the creek. Flooding in Clunes can be caused by either overland flooding form local catchment or from riverine flooding from Creswick Creek. Ensure bridges over Creswick Creek at Clunes-Campbelltown Road and Bailey Street are monitored to ensure that the bridges are not blocked by debris.		Purcell Street depth 0m West Parade depth 0m Fraser Street depth 0m Angus Street depth 0m Ligar Street depth 0m	VICSES activate CFA ground observers to take photos and record flood levels at key crossings. Council and Regional Roads clear debris from waterway crossings, drains and culverts as needed.
~56 mm in 6 hours	3.46	10 (10%)	7,630	0 (0)	Creswick Creek is at full capacity, close to breaking its banks. Access is cut to the Scenic Drive crossing along Creswick Creek, north of Clunes.		Purcell Street depth 0m West Parade depth 0m Fraser Street depth 0m Angus Street depth0m Ligar Street depth 0m	Council and Regional Roads Victoria to deploy road closure signs and undertake traffic management as needed. VICSES warn residents. Police prepare for evacuations.
~66 mm in 6 hours	4.48	20 (5%)	12,730	23 (4)	Floodwater breaks out of Creswick Creek. Four buildings are flooded over floor, these include; the Clunes Swimming Pool chemical storage building and two accommodation buildings. On the right bank the Bull Milligan Oval starts to be is impacted by flooding, up to 0.57 m depth. On the left bank flooding impacts the grounds of the Clunes Caravan Park, up to 0.4m depth. Deep flooding is likely to cut access to Purcell Street, Fraser Street and West Parade.	Four buildings are flooded over floor: 1 Purcell Street, 1A Cameron Street, 19 Fraser Street and the Clunes Swimming Pool chemical storage building in Ligar Street.	Purcell Street depth 0.32m West Parade depth 0.33m Fraser Street depth 0.27m Angus Street depth 0m Ligar Street depth 0m	In addition to actions listed above: Council monitor culverts and drains to check for debris build up, clear debris from waterway crossings, drains and culverts as needed. Victoria Police evacuate people from buildings at risk of flooding or isolation as needed.
	5.43	September 2010 25 year event (4%)		40				
	6.39	January 2011 40 year event (2.5%)		57				
~80 mm in 6 hours	6.67	50 (2%)	20,485	52 (21)	17 additional buildings are flooded above floor, these include; two buildings at the Clunes Caravan Park (Purcell Street). 11 commercial shops and businesses along Fraser Street are inundated, including Timmermans Furniture and the Red Door Gallery. Flooding cuts access to Angus Street and Ligar Street. The lowest bowling green is inundated in Ligar Street, depth greater than 0.35 m.	An additional 17 buildings are flooded over floor: x11 Fraser Street (4, 5, 9, 6/16, 17, 23, 67, 69, 77, 81, 87), x3 Purcell Street Clunes (3, 7, 17), 4 West Parade, 1 Cameron Street, Unknown - Service Street.	Purcell Street depth 0.83m West Parade depth 0.98m Fraser Street depth 1.0m Angus Street depth 0.5m Ligar Street depth 0.35m	In addition to actions listed above: Due to additional buildings at risk of flooding, Victoria Police evacuate people from buildings at risk of flooding or isolation as needed.
~92 mm in 6 hours	7.10	100 (1%)	27,250	70 (44)	23 additional buildings are flooded above floor. 16 additional commercial shops and businesses are inundated along Fraser Street, these include: the Library, Pharmacy and Post Office and a building at the rear of the National Hotel. Floodwater overtops Fraser Street between Templeton and Service Street.	An additional 23 buildings are flooded over floor: x16 Fraser Street (15, 29, 35, 41, 43, 49, 51, 53, 55, 57, 59, 61, 63, 65, 73, 81, 83), X3 Angus Street (24, 26, 28), x2 Ligar Street (1, 3), 5 Purcell Street.	Purcell Street depth 1.21m West Parade depth 1.39m Fraser Street depth 1.46m Angus Street depth 0.89m Ligar Street depth 0.65m	In addition to actions listed above: Due to additional buildings at risk of flooding, Victoria Police evacuate people from buildings at risk of flooding or isolation as needed.
~105 mm in 6 hours	7.62	200 (0.5%)	34,015	76 (57)	Flood extent has not significantly increased but flood depths have increased. 13 additional buildings are flooded above floor, these include; the Senior Citizens Centre at 25 Fraser Street.	An additional 13 buildings are flooded over floor: X8 Fraser Street (25, 27, 31, 33, 35, 39, 45, 46, 50), x2 Purcell Street (11, 17), 32 Angus Street, 5 Ligar Street.	Purcell Street depth 1.54m West Parade depth 1.73m Fraser Street depth 1.81m Angus Street depth 1.18m Ligar Street depth 0.87m	In addition to actions listed above: Due to additional buildings at risk of flooding, Victoria Police evacuate people from buildings at risk of flooding or isolation as needed.

Clunes above floor building damages for a range of design flood events with the 100 year ARI flood extent (Water Technology 2012).

Clunes Property Inundation Table (Water Technology 2012)

Colours used in the property table below are the same used in the Clunes above floor damages map above. Red, buildings flooded above floor in a 20 year ARI flood event. Green, buildings flooded above floor in a 50 year ARI flood event, etc.

No	Address	Depth of building over-floor flooding for each ARI event (m)				Building Type
		20	50	100	200	
1	1A Cameron Street Clunes	0.241	0.855	1.199	1.468	accommodation - cottage
2	1 Purcell Street Clunes	0.105	0.649	1.047	1.386	dwelling
3	19 Fraser Street Clunes	0.04	0.519	0.862	1.211	accommodation - cottage
4	unknown - Ligar Street Clunes	0.036	0.685	1.031	1.279	swimming pool building
5	17 Purcell Street Clunes		0.651	0.932	1.152	Caravan Park - Reception
6	9 Fraser Street Clunes		0.53	1.007	1.373	dwelling
7	6/16 Fraser Street Clunes		0.5	0.983	1.352	
8	5 Fraser Street Clunes		0.465	0.926	1.282	dwelling
9	4 Fraser Street Clunes		0.39	0.84	1.19	dwelling
10	7 Purcell Street Clunes		0.374	0.76	1.086	dwelling
11	81 Fraser Street Clunes		0.344	0.688	0.928	Shed
12	69 Fraser Street Clunes		0.294	0.558	0.774	Red Door Gallery
13	3 Purcell Street Clunes		0.218	0.587	0.915	dwelling
14	17 Fraser Street Clunes		0.216	0.632	0.999	
15	23 Fraser Street Clunes		0.181	0.522	0.875	retail
16	Unknown - Service Street Clunes		0.181	0.465	0.683	
17	87 Fraser Street Clunes		0.158	0.524	0.775	dwelling
18	4 West Parade Clunes		0.151	0.546	0.881	dwelling
19	1 Cameron Street Clunes		0.079	0.42	0.768	
20	77 Fraser Street Clunes		0.074	0.407	0.638	dwelling
21	67 Fraser Street Clunes		0.02	0.426	0.697	Timmermans Furniture
22	15 Fraser Street Clunes			0.431	0.799	dwelling
23	24 Angus Street Clunes			0.292	0.61	dwelling
24	5 Purcell Street Clunes			0.278	0.603	dwelling
25	65 Fraser Street Clunes			0.246	0.508	Retail
26	83 Fraser Street Clunes			0.24	0.488	dwelling
27	73 Fraser Street Clunes			0.236	0.466	dwelling
28	26 Angus Street Clunes			0.22	0.509	dwelling
29	1 Ligar Street Clunes			0.204	0.453	dwelling
30	28 Angus Street Clunes			0.159	0.446	dwelling
31	63 Fraser Street Clunes			0.142	0.416	Weavery Classroom
32	57 Fraser Street Clunes			0.14	0.339	Retail - for lease
33	59 Fraser Street Clunes			0.132	0.386	
34	61 Fraser Street Clunes			0.132	0.351	

No	Address	Depth of building over-floor flooding for each ARI event (m)				Building Type
		20	50	100	200	
35	National Hotel, 35 Fraser Street Clunes			0.126	0.457	dwelling rear
36	53 Fraser Street Clunes			0.107	0.32	library
37	51 Fraser Street Clunes			0.102	0.317	Retail
38	55 Fraser Street Clunes			0.097	0.299	Retail - photographer
39	3 Ligar Street Clunes			0.088	0.328	dwelling
40	49 Fraser Street Clunes			0.051	0.261	Retail - Newsagent
41	81 Fraser Street Clunes			0.046	0.297	dwelling
42	41 Fraser Street Clunes			0.04	0.209	Retail
43	29 Fraser Street Clunes			0.029	0.221	Retail
44	43 Fraser Street Clunes			0.018	0.192	Retail West
45	25 Fraser Street Clunes				0.297	Senior Citizens Centre
46	50 Fraser Street Clunes				0.28	Retail
47	National Hotel, 35 Fraser Street Clunes				0.265	dwelling rear brick
48	11 Purcell Street Clunes				0.253	dwelling
49	45 Fraser Street Clunes				0.203	Retail - Real Estate
50	46 Fraser Street Clunes				0.17	
51	32 Angus Street Clunes				0.157	
52	33 Fraser Street Clunes				0.151	Retail
53	17 Purcell Street Clunes				0.136	
54	31 Fraser Street Clunes				0.095	Retail - Bookshop
55	39 Fraser Street Clunes				0.034	Dwelling/Office
56	27 Fraser Street Clunes				0.026	Retail
57	5 Ligar Street Clunes				0.003	dwelling

Appendix D: Flood evacuation arrangements

Phase 1 - Decision to Evacuate

The decision to evacuate is to be made by the Incident Controller in consultation with the MERO, MERC, DHHS, Health Commander and other key agencies and expert advice (CMA's and Flood Intelligence specialists).

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.

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

Victoria Police 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 Victoria Police/ Regional Roads Victoria with route control and may assist Victoria Police in arranging evacuation transportation.

Victoria Police 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.

Landing zones for helicopters are located at:

- Ballarat Airport (if access is not cut by flooding)
- Ballarat Base Hospital

Special needs groups will be/are identified in Council's 'vulnerable persons register'. This can be done through community network organisations.

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.

Victoria Police 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 shelter compounds will be established for domestic pets and companion animals of evacuees.

Phase 5 – Return

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

Victoria Police 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.

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.

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 Hepburn 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 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 Hepburn Emergency Alert key messages for a severe flash flood event
The BOM have issued a Severe Weather Waring: Heavy Rain

Heavy rainfall in the upper Creswick Creek catchment has led to flash flooding in Clunes and Creswick. Recorded rainfall from 9am this morning at Creswick was ???mm (INCLUDE RECORDED RAINFALL). Locally heavier falls could have occurred due to embedded thunderstorms. This will cause further rises in flood levels in waterways.

Locations which may be affected could include: Clunes and Creswick

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 4 to 6 hours from the start of rainfall.
Floodwater may cut access to main roads, avoid driving until the storm and floodwater has subsided.

Waterways likely to be affected include:
- Creswick Creek
- Spring Creek
- Nuggetty Gully

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.

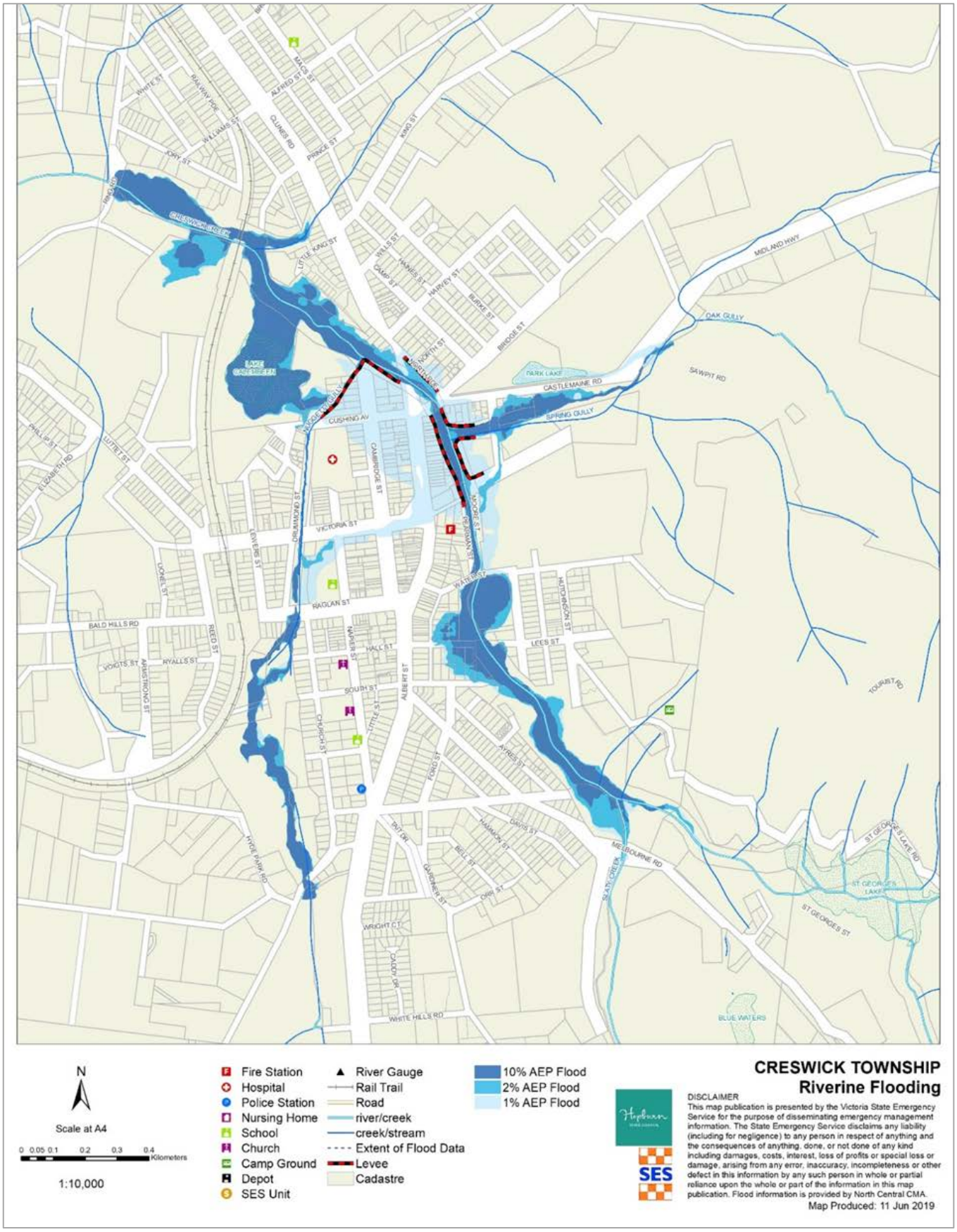
Current Road and Traffic Information is available at the VicRoads website: http://traffic.vicroads.vic.gov.au

Weather Forecast:

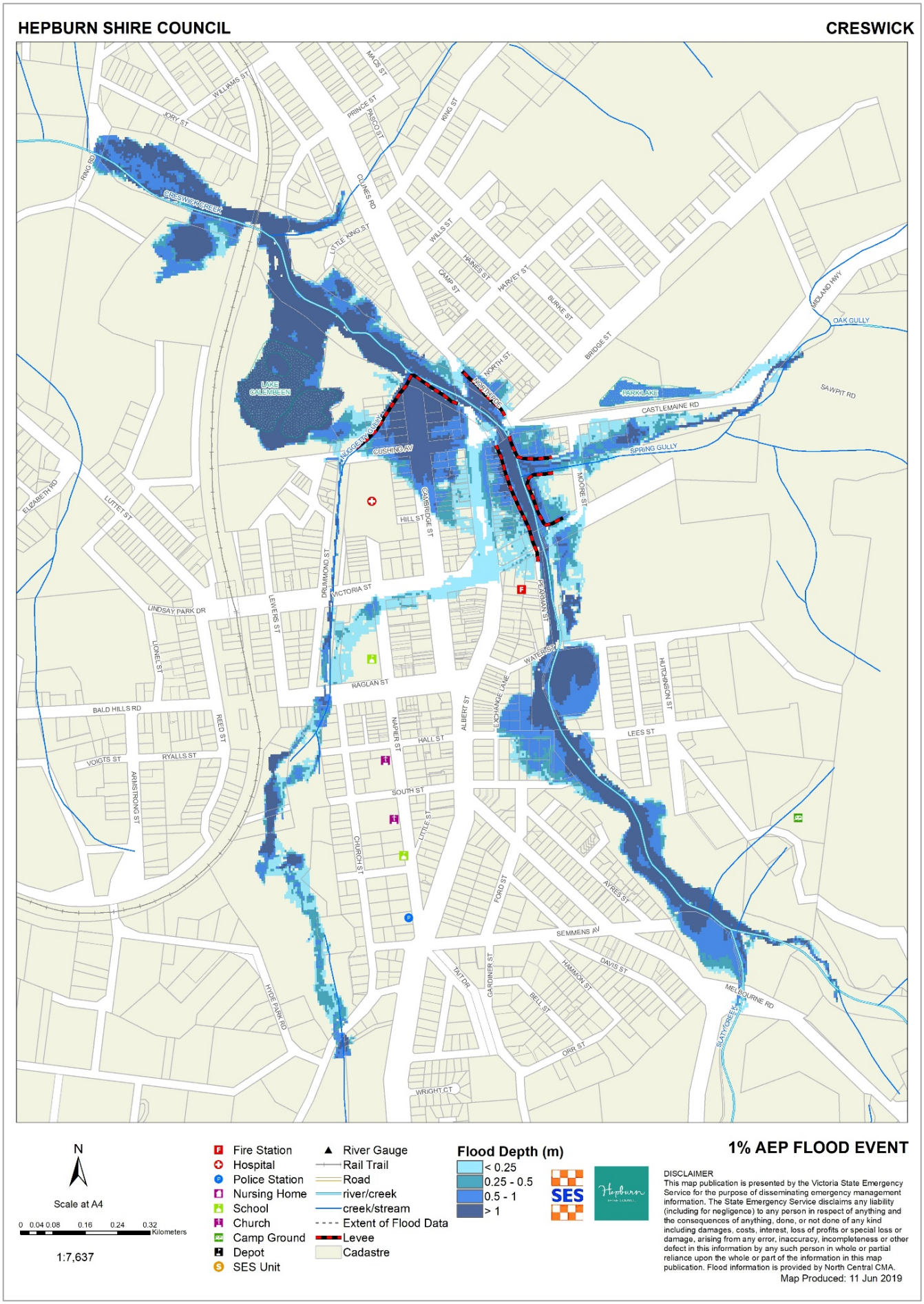
For the latest weather forecast see http://www.bom.gov.au/vic/forecasts/

Appendix F: Flood Maps

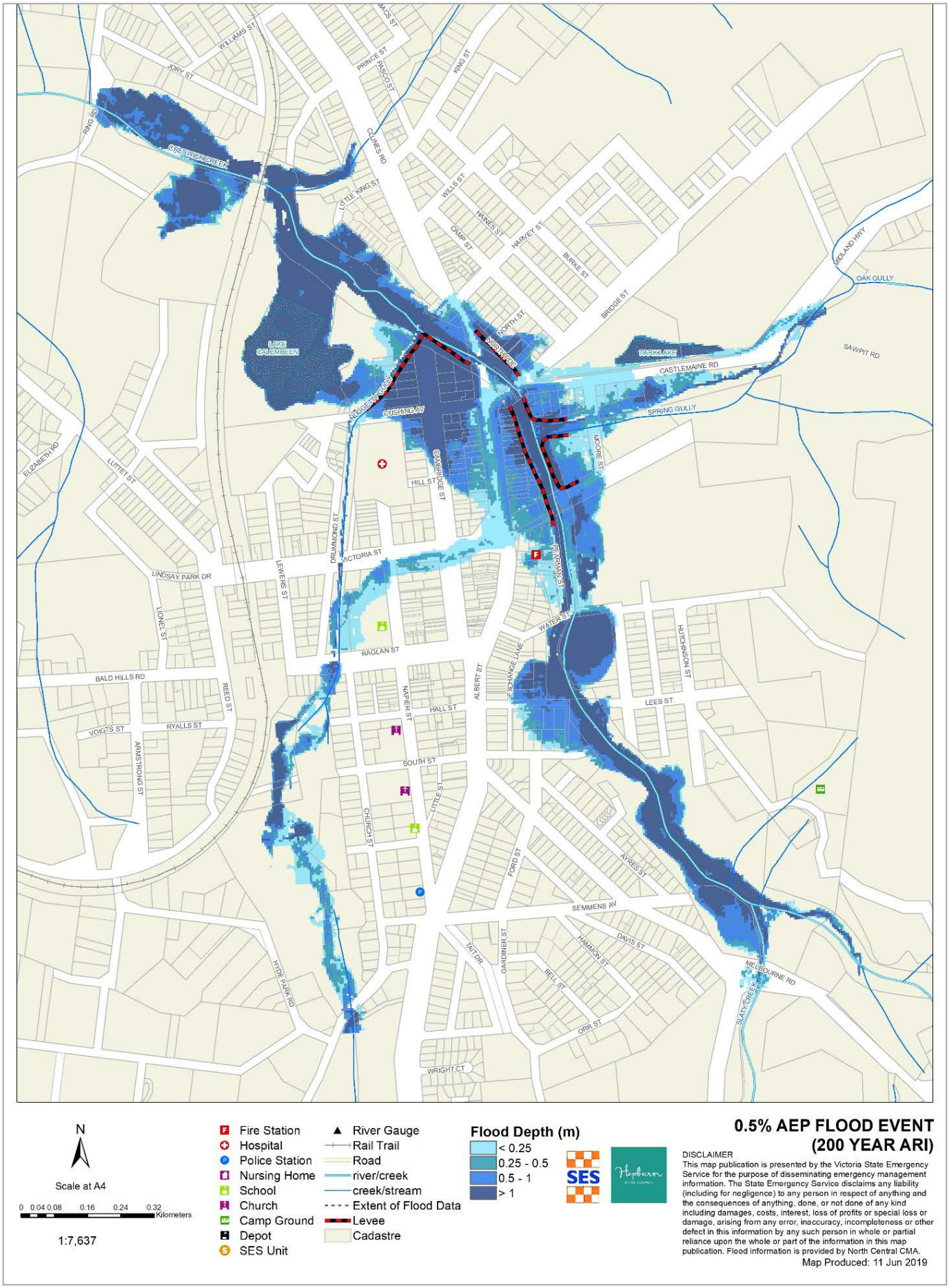
1.1. Creswick Flood Extent Maps. Creswick 10, 50 and 100 year ARI flood extent map (Water Technology 2012).



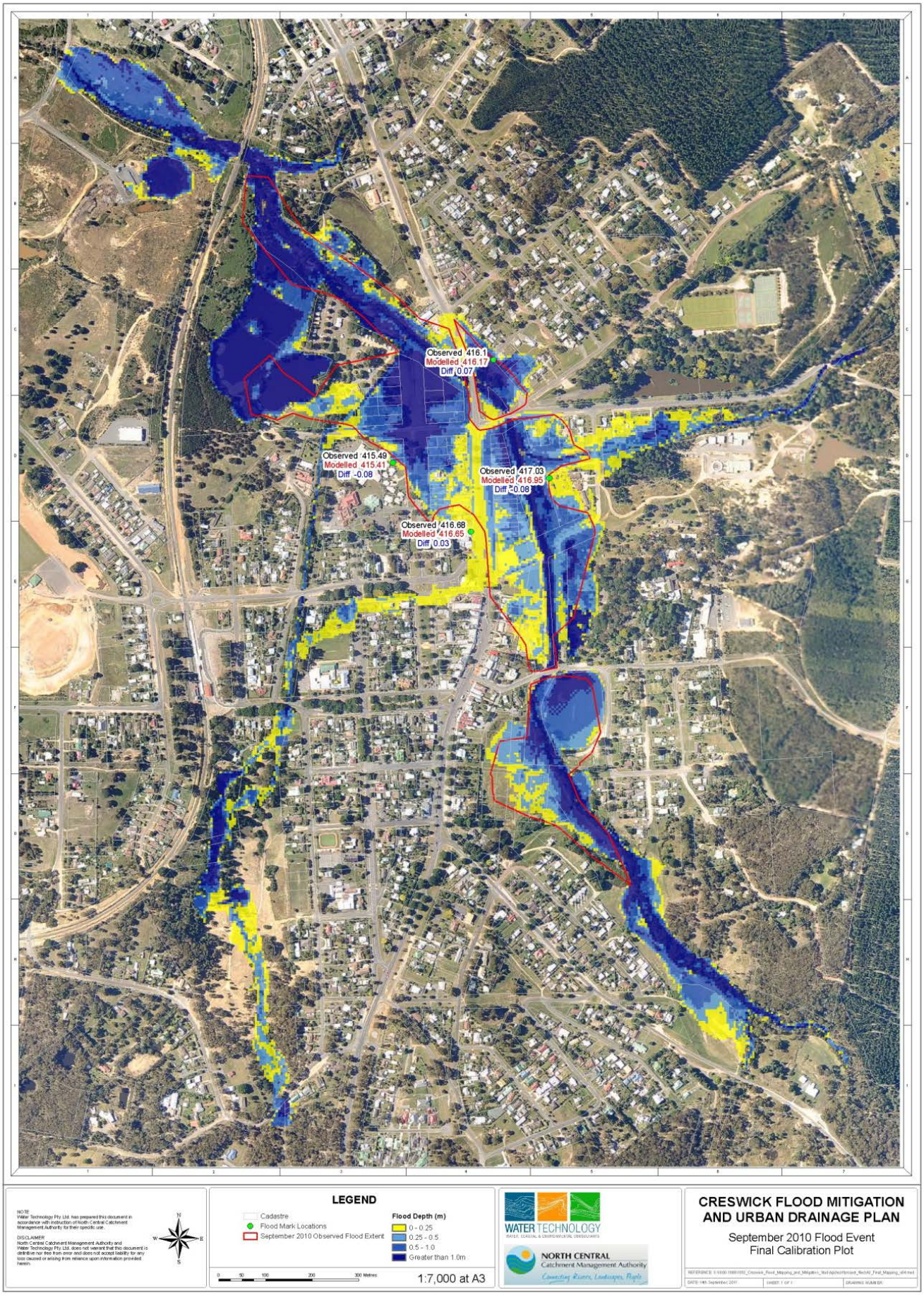
Creswick 100 year ARI flood depth map (Water Technology 2012).



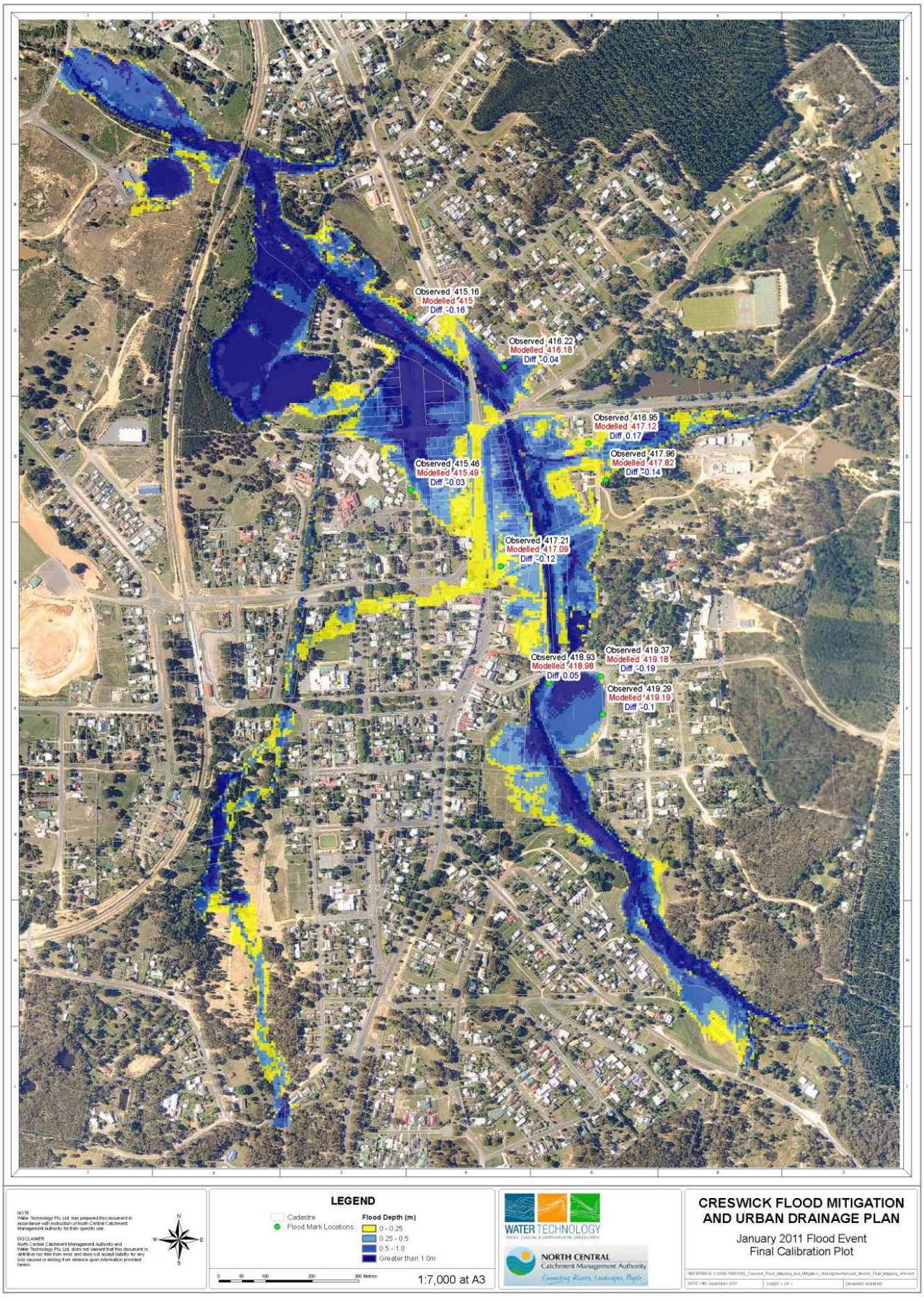
Creswick 200 year ARI flood depth map (Water Technology 2012).



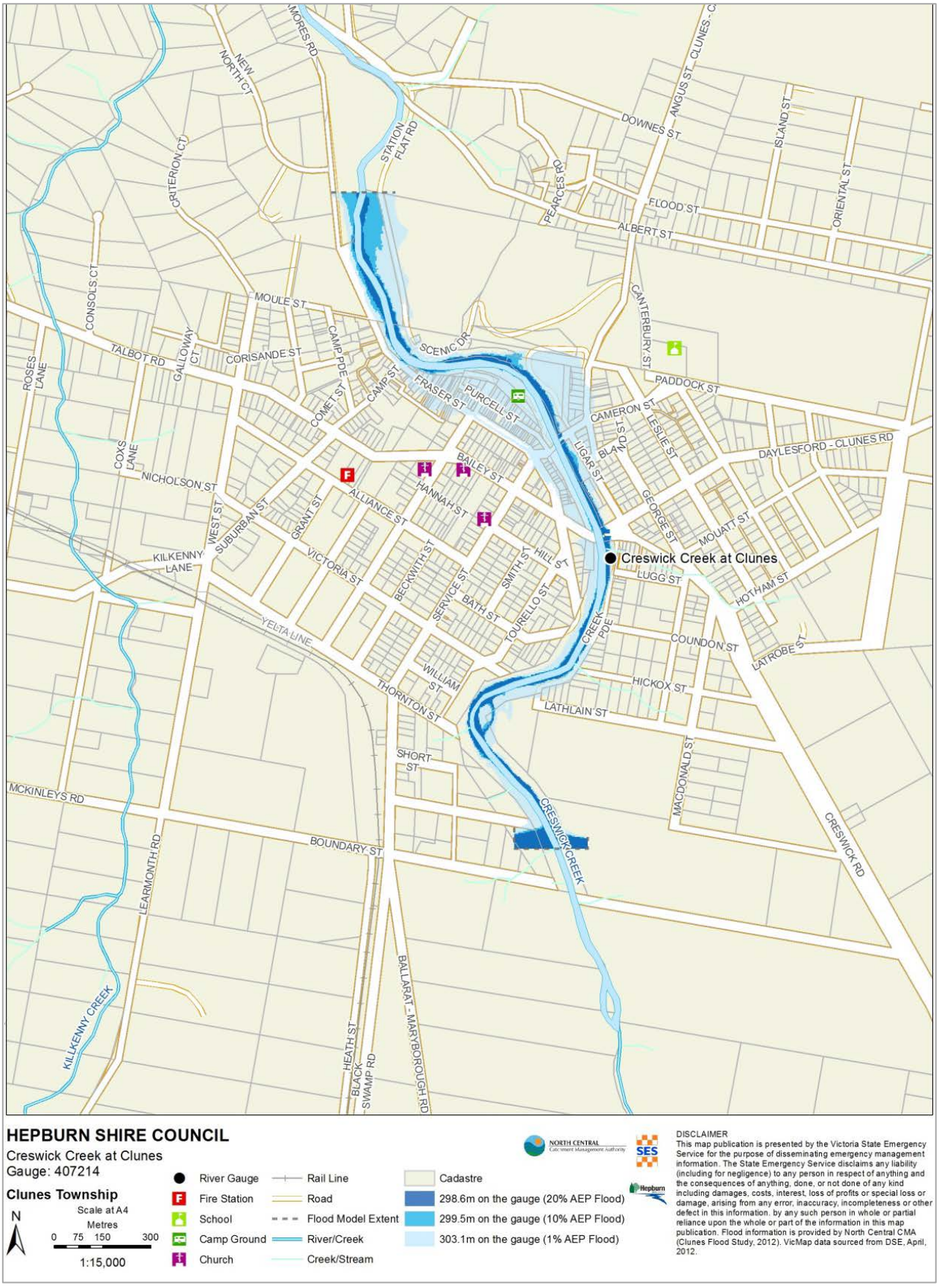
Creswick September 2010 flood event inundation map (Water Technology 2012).



Creswick January 2011 flood event inundation map (Water Technology 2012).

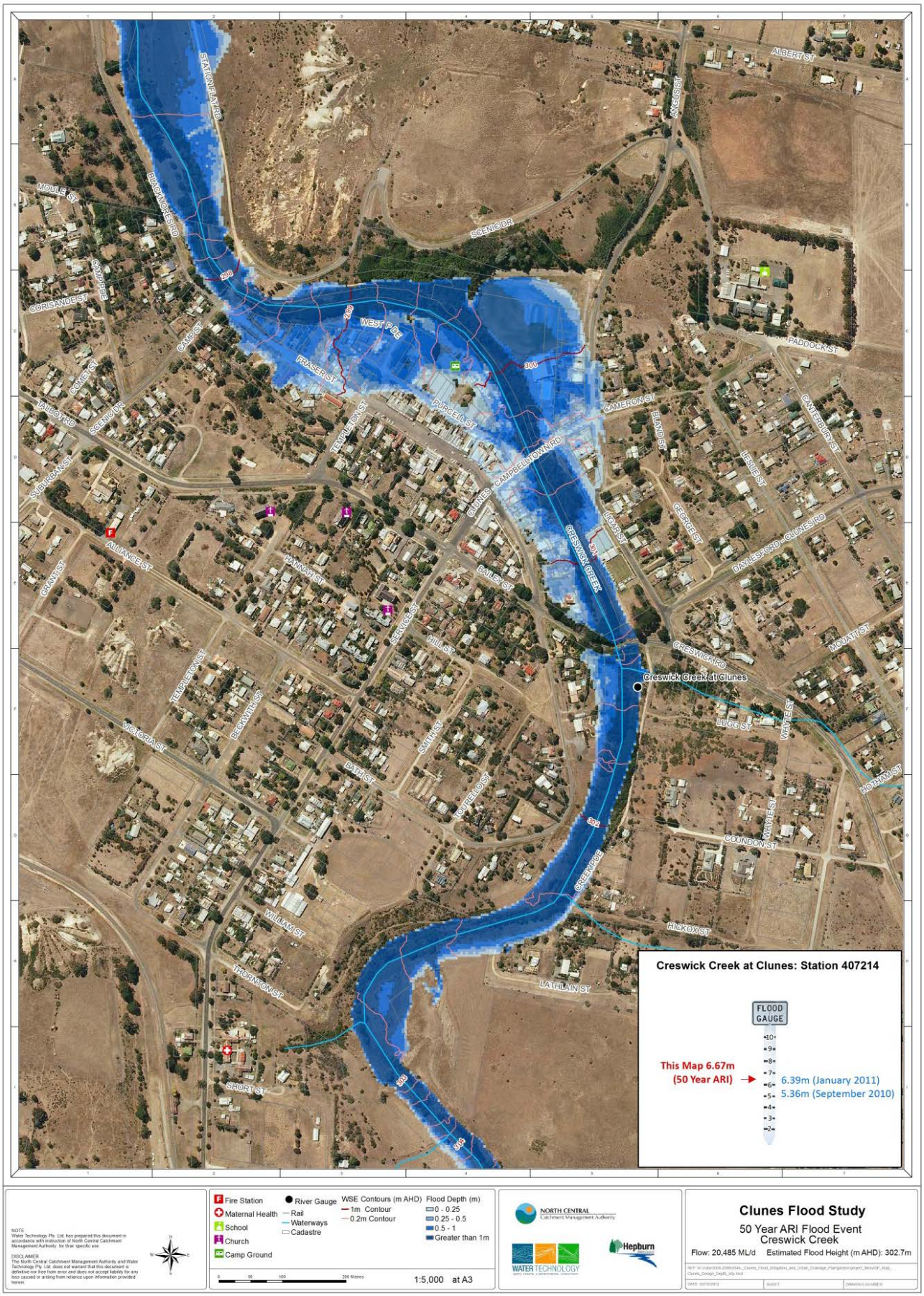

Observed 415.16
Modelled 415
Diff -0.16
Observed 416.22
Modelled 416.18
Diff -0.04
Observed 416.95
Modelled 417.12
Diff 0.17
Observed 417.96
Modelled 417.82
Diff -0.14
Observed 415.46
Modelled 415.49
Diff -0.03
Observed 417.21
Modelled 417.09
Diff -0.12
Observed 418.93
Modelled 418.98
Diff 0.05
Observed 419.37
Modelled 419.18
Diff -0.19
Observed 419.29
Modelled 419.19
Diff -0.1
LEGEND
Cadastre
Flood Mark Locations
Flood Depth (m)
0 - 0.25
0.25 - 0.5
0.5 - 1.0
Greater than 1.0m
1:7,000 at A3
WATER TECHNOLOGY
NORTH CENTRAL
Catchment Management Authority
CRESWICK FLOOD MITIGATION
AND URBAN DRAINAGE PLAN
January 2011 Flood Event
Final Calibration Plot

1.2. Clunes Flood Extent Maps. Clunes 5, 10 and 100 year ARI flood extent map (Water Technology 2013).

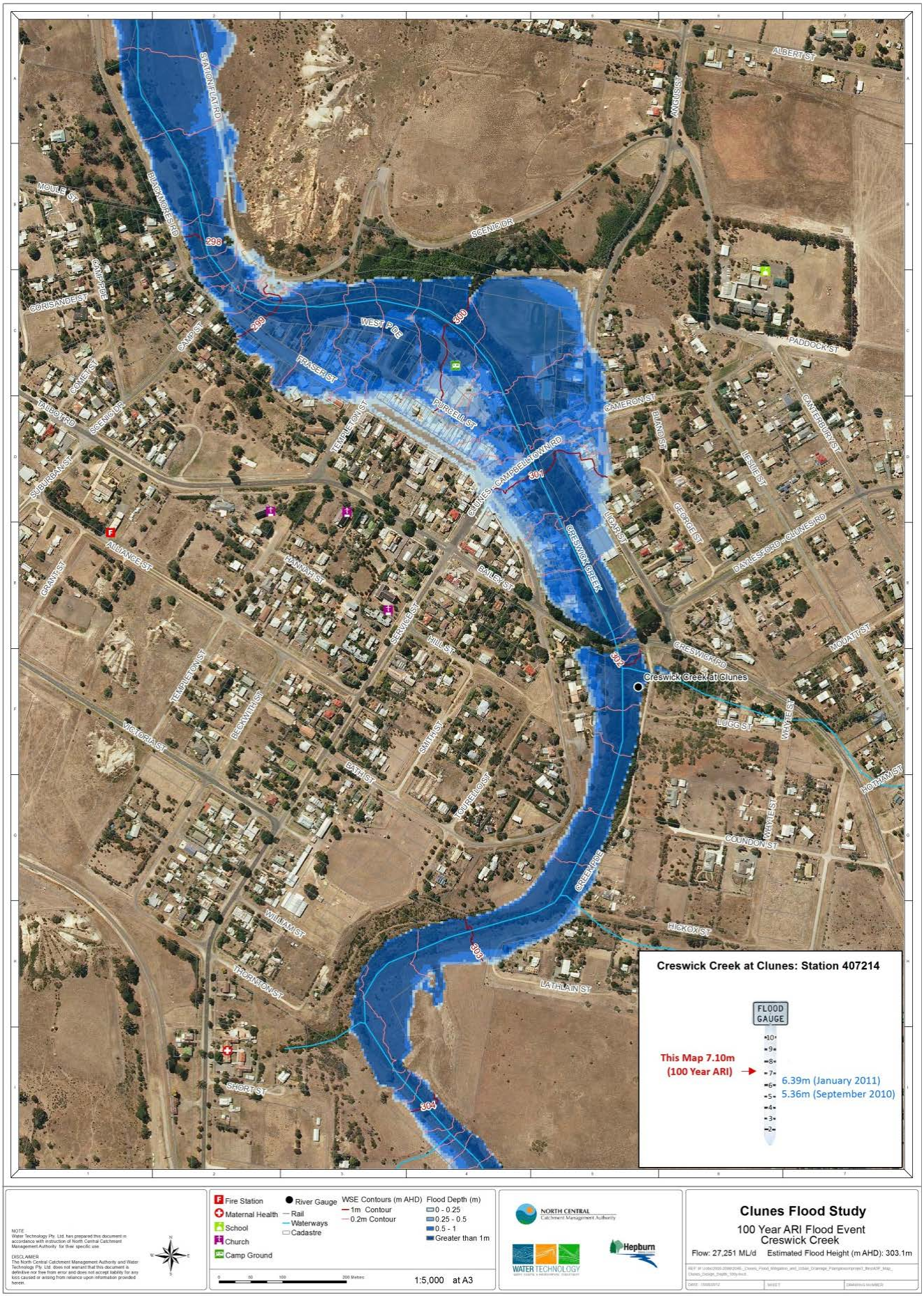


Clunes 20 year ARI flood depth map (Water Technology 2012).

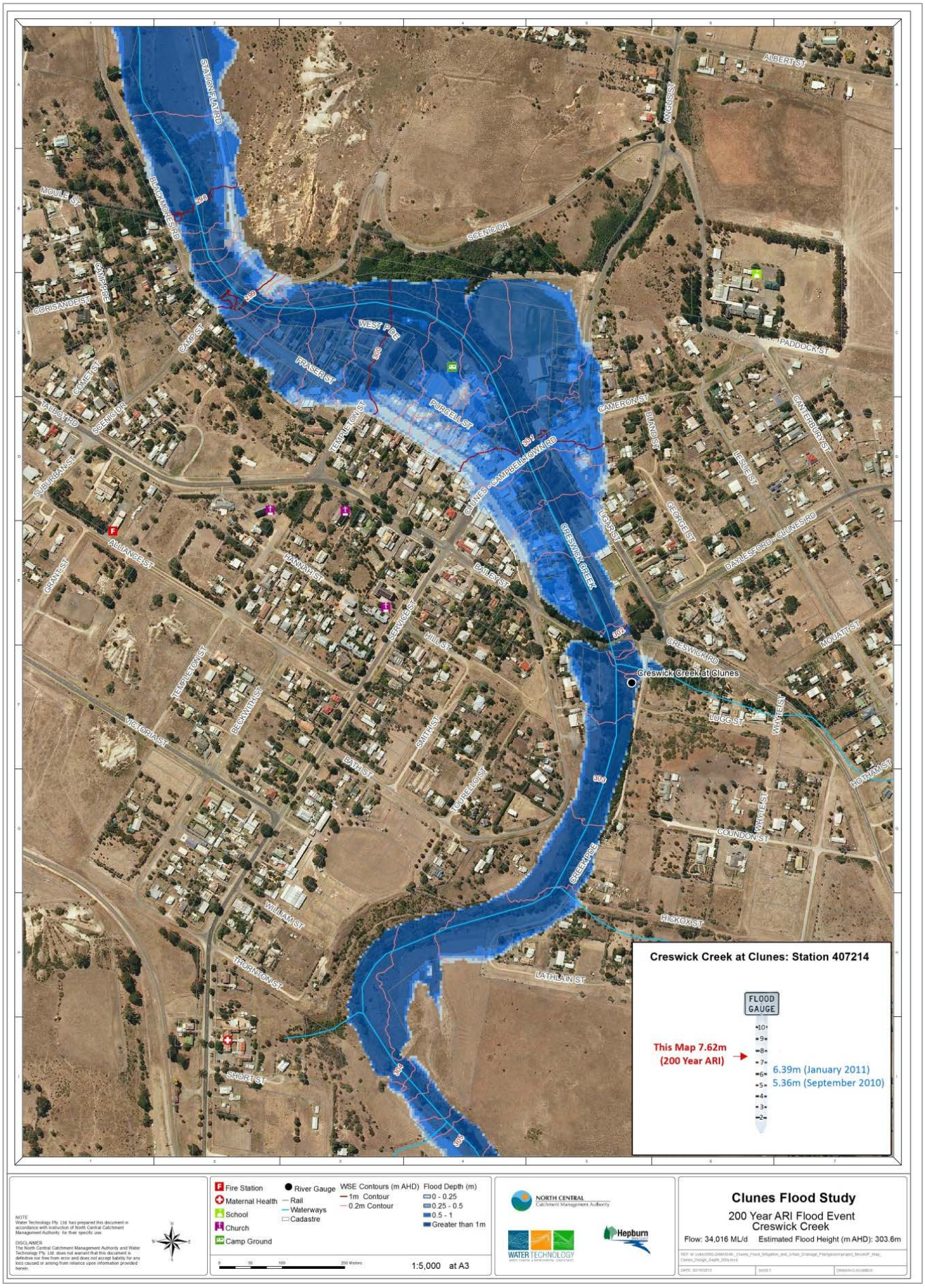
Clunes 50 year ARI flood depth map (Water Technology 2012).



Clunes 100 year ARI flood depth map (Water Technology 2012).



Clunes 200 year ARI flood depth map (Water Technology 2012).



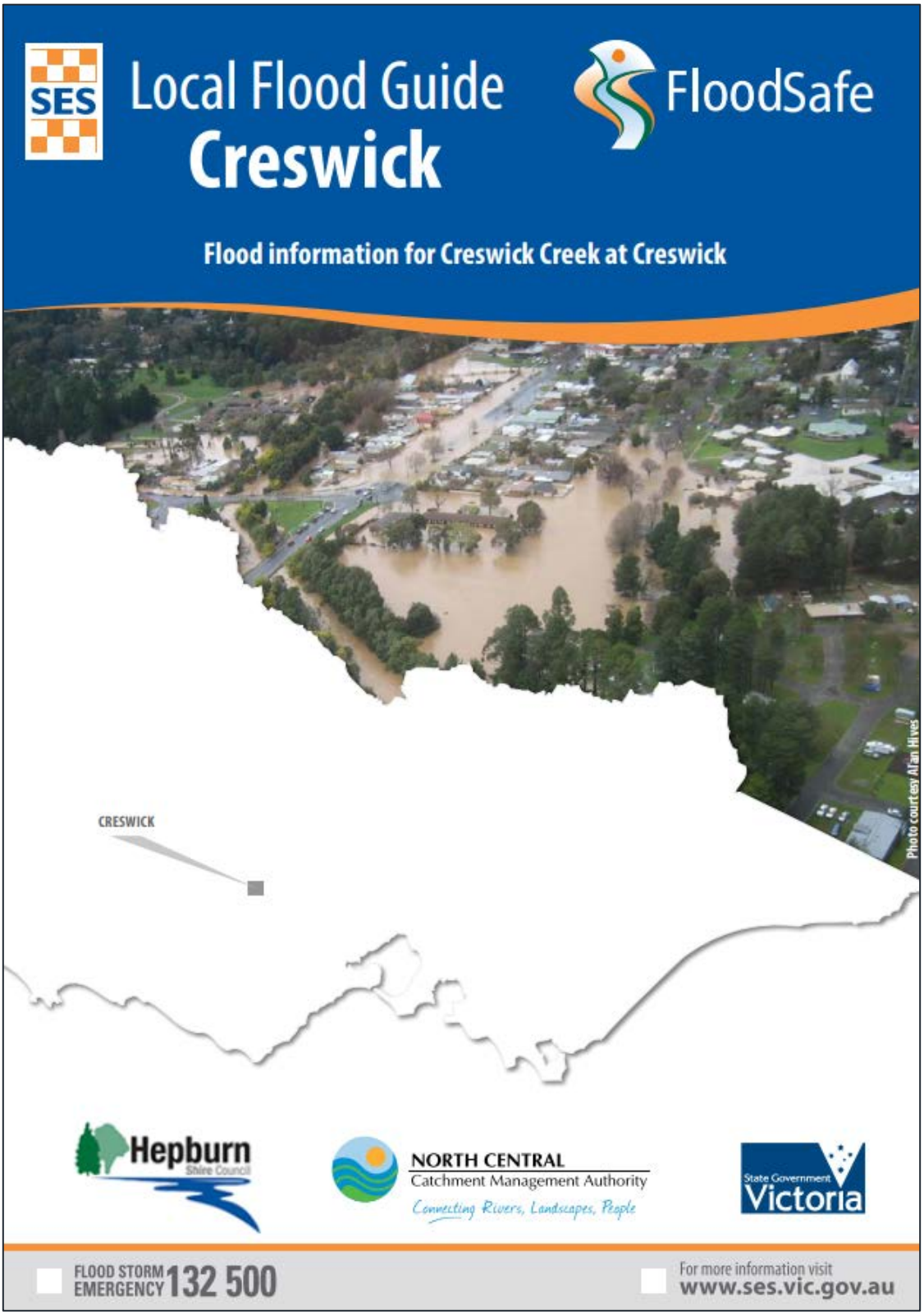
Clunes September 2010 flood event inundation map (Water Technology 2012).

Clunes January 2011 flood event inundation map (Water Technology 2012).

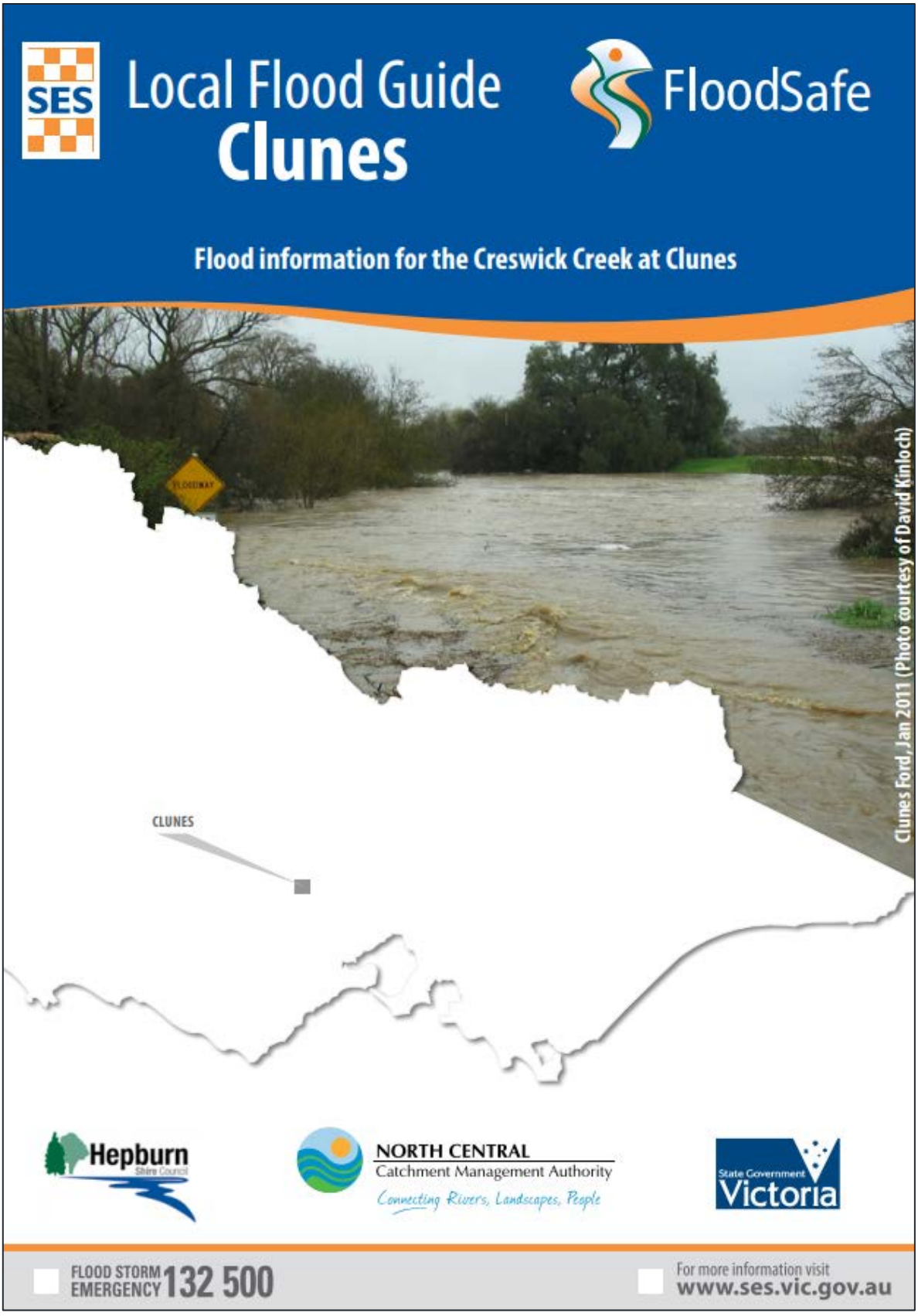
Appendix G: Local flood information

There have been three Local Flood Guides developed for the Hepburn Shire Council Region;

- Refer to the link below for the Creswick Local Flood Guide
  https://www.ses.vic.gov.au/documents/112015/135175/Creswick+Local+Flood+Guide.pdf/24c7a298-3255-497b-ad10-d99ba812c6c3



- Refer to the link below for the Clunes Local Flood Guide
  https://www.ses.vic.gov.au/documents/112015/135175/Clunes+Local+Flood+Guide.pdf/cbcdedc1-5007-4858-a90e-b6693a50e2af



Appendix H: Local knowledge arrangements

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.

For the Hepburn Shire Council region community observers identified are:

Town	Observer Details	Community Observer Name	Contact Details
Creswick	Creswick CFA Brigade via D15 RDO	D15 RDO	5329 5500
Clunes	Clunes CFA Brigade via D15 RDO	D15 RDO	5329 5500

References

Water Technology (2012): Clunes Flood Mitigation and Urban Drainage Plan.

Water Technology (2012): Creswick Flood Mitigation and Urban Drainage Plan.