



South Gippsland Shire Flood Emergency Plan

A Sub-Plan of the
Municipal Emergency Management Plan

South Gippsland Shire Council and
VICSES East Region and Foster & Leongatha Units

Version 1.4 February 2013



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- Appendix A - Flood Threats*
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- Appendix E - Flood Warning Systems*
- Appendix F - Maps*

Distribution List

The Distribution List for this sub plan is the same as in the Municipal Emergency Management Plan.

Document Transmittal Form / Amendment Certificate

This Municipal Flood Emergency Plan (MFEP) will be amended, maintained and distributed as required by VICSES in consultation with the South Gippsland Shire.

Suggestions for amendments to this Plan should be forwarded to VICSES Regional Headquarters Gippsland, 82a Moore Street, Moe.

Amendments listed below have been included in this Plan and promulgated to all registered copyholders.

Amendment Number	Date of Amendment	Amendment Entered By	Summary of Amendment

This Plan will be maintained on the South Gippsland Shire website www.southgippsland.vic.gov.au.

List of Abbreviations & Acronyms

The following abbreviations and acronyms are used in the Plan:

AEP	Annual Exceedance Probability
AHD	Australian Height Datum (the height of a location above mean sea level in metres)
AIIMS	Australasian Inter-service Incident Management System
AoCC	Area of Operations Control Centre / Command Centre
ARI	Average Recurrence Interval
ARMCANZ	Agricultural & Resource Management Council of Australia & New Zealand
AV	Ambulance Victoria
BoM	Bureau of Meteorology
CEO	Chief Executive Officer
CERA	Community Emergency Risk Assessment
CERM	Community Emergency Risk Management
CFA	Country Fire Authority
CMA	Catchment Management Authority
RERC	Regional Emergency Response Coordinator
RERCC	Regional Emergency Response Coordination Centre
DHS	Department of Human Services
DH	Department of Health
Dol	Department of Infrastructure
DPI	Department of Primary Industries
DSE	Department of Sustainability and Environment (successor body to DNRE)
EMLO	Emergency Management Liaison Officer
EMMV	Emergency Management Manual Victoria
EMT	Emergency Management Team
EO	Executive Officer
FO	Floodway Overlay
FWS	Flood Warning System
FZ	Floodway Zone
IC	Incident Controller
ICC	Incident Control Centre
IMT	Incident Management Team
IMS	Incident Management System
LSIO	Land Subject to Inundation Overlay
MECC	Municipal Emergency Coordination Centre
MEMP	Municipal Emergency Management Plan
MEMPC	Municipal Emergency Management Planning Committee
MERC	Municipal Emergency Response Coordinator
MERO	Municipal Emergency Resource Officer
MFB	Metropolitan Fire and Emergency Services Board
MFPC	Municipal Flood Planning Committee
MRM	Municipal Recovery Manager
PMF	Probable Maximum Flood
RCC	Regional Control Centre
RDO	Regional Duty Officer
SBO	Special Building Overlay
SCC	State Control Centre
SEWS	Standard Emergency Warning System
SGSC	South Gippsland Shire Council
SHERP	State Health Emergency Response Plan
SOP	Standard Operating Procedure
VicPol	Victoria Police
VICSES	Victoria State Emergency Service
WGCMA	West Gippsland Catchment Management Authority

Part 1. INTRODUCTION

1.1 Municipal Endorsement

The South Gippsland Shire Council is the custodian of this Municipal Flood Emergency Plan (MFEP), as a sub plan of the Municipal Emergency Management Plan.

This MFEP has been prepared by the Municipal Flood Planning Sub-Committee with the authority of the Municipal Emergency Management Committee (refer to section 1.6 endorsement of plan) pursuant to Section 20 of the Emergency Management Act 1986 (as amended).

The South Gippsland Shire Council has and will continue to undertake consultations with the communities of South Gippsland about the arrangements contained within this plan as detailed in Councils “*Community & Consultation Strategy Tool Kit*” which is available on their website.

This MFEP is a sub plan to the South Gippsland Shire Municipal Emergency Management Plan (MEMP), is consistent with the Emergency Management Manual Victoria (EMMV), the Victoria Flood Management Strategy (DNRE, 1998a), the Regional Flood Emergency Plan, the State Flood Emergency Plan and takes into account the outcomes of the Community Emergency Risk Assessment (CERA) process undertaken by the Municipal Emergency Management Planning Committee (MEMPC).

This Municipal Flood Emergency Plan is a result of the cooperative efforts of the South Gippsland Shire Flood Planning Sub-Committee (MFPC) and its member agencies. The signatories below, on behalf of their respective agencies commit to the implementation of this plan as it applies to each agency.

Tim Tamlin

Chief Executive Officer
South Gippsland Shire Council

Date:

Clint Saarinen

Regional Manager
VICSES East Region

Date:

Ricky Ross APM

Regional Emergency Management Inspector
Victoria Police

Date:

1.2 The Municipality Flood Risk Profile

An outline of South Gippsland Shire in terms of its location, demography and other general matters is provided in the MEMP.

The 2011 CERM Review identified Flood as an extreme risk within South Gippsland Shire, as detailed in the MEMP. Further risk assessment processes, including the Community Emergency Risk Assessment – CERA process and the Flood Management Plan, have identified risks in relation to storm, flash flooding and riverine flooding within South Gippsland.

Detailed flood threats, information and response information and identified at risk communities are provided in the appendices to this plan.

1.3 Purpose and Scope of this Flood Emergency Plan

The purpose of this MFEP is to detail arrangements agreed for the planning, preparedness/prevention, response and recovery from severe storm and flood incidents within South Gippsland Shire.

As such, the scope of the Plan is to:

- Identify the flood & severe storm risk to South Gippsland Shire;
- Support the implementation of measures to minimise the causes and impacts of flood and severe storm incidents within the South Gippsland Shire;
- Detail Response and Recovery arrangements including preparedness, Incident Management, Command and Control and Co-ordination;
- Identify linkages with Local, Regional and State emergency and wider planning arrangements with specific emphasis on those relevant to flood.

1.4 Municipal Flood Planning Sub-Committee (MFPC)

Membership of the South Gippsland Shire Flood Planning Sub-Committee (MFPC) will comprise of the following representatives from the following agencies and organisations:

- Victoria Police (i.e. Municipal Emergency Response Co-ordinator) (MERC) **(Chair)**;
- VICSES, Regional Officer – Emergency Management;
- South Gippsland Shire, MERO;
- West Gippsland Catchment Management Authority;
- Department of Sustainability and Environment;
- Parks Victoria;
- VicRoads;
- Gippsland Water;
- South Gippsland Water;
- Southern Rural Water;
- Melbourne Water; and
- Other agencies and community representatives or consultants as required.

1.5 Responsibility for Planning, Review & Maintenance of this Plan

This Municipal Flood Emergency Plan must be maintained in order to remain effective.

VICSES through the Municipal Flood Planning Sub-Committee (MFPC) has responsibility for preparing, reviewing, maintaining and distributing this plan.

The MFPC will meet at least once per year.

The plans should be reviewed and where necessary amended following:

-
- any new flood study;
 - any change in non-structural and/or structural flood mitigation measures;
 - the occurrence of a significant flood event within the Municipality.

1.6 Endorsement of the Plan

The MFEP will be circulated to Municipal Flood Planning Sub-Committee members seeking acceptance of the draft plan.

Upon acceptance, the MFEP is forwarded to the MEMPC for endorsement with the recommendation to include the MFEP as a sub-plan of the MEMP.

Part 2. PREVENTION / PREPAREDNESS ARRANGEMENTS

2.1 Community Awareness for all Types of Flooding

Details of this MFEP will be released to the community through local media, the FloodSafe program and websites (VICSES and the Municipality) upon formal adoption by South Gippsland Shire Council.

VICSES will co-ordinate community education programs for flooding within the Council area, with the support of South Gippsland Shire, West Gippsland CMA and Melbourne Water, eg StormSafe / FloodSafe.

A specific community engagement plan will be produced jointly by VICSES and Council.

2.2 Structural Flood Mitigation Measures

Existing structural flood mitigation measures that exist within the Council area are listed in the appendices to this plan.

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. This Plan should be regularly exercised, preferably on an annual basis. Refer to section 4.7 of the EMMV for guidance.

2.3.2 Flood & Severe Storm Warning

Arrangements for flood and severe storm warnings are contained within the State Flood Emergency Plan and the EMMV (Part 3.7) and on the BoM website.

There are no flood warning systems in the South Gippsland Shire, however a Flood Watch may be issued for the area by the BoM. Council's Flood Management Plan has listed an action to prioritise the installation of flood warning services in South Gippsland Shire.

The BoM operates a Severe Storm warning service for the South Gippsland area.

2.3.3 Flood Wardens

No arrangements exist or are planned in South Gippsland Shire for Flood Wardens.

Part 3. RESPONSE ARRANGEMENTS

3.1 Introduction

3.1.1 Activation of Response

Flood or severe storm response arrangements may be activated by the Regional Duty Officer (RDO) VICSES East Region or Incident Controller.

The Incident Controller/RDO VICSES will activate agencies as required and documented in the State Flood Emergency Plan.

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 or storm within the South Gippsland Shire. These agencies will be engaged through the Emergency Management Team (EMT).

The general roles and responsibilities of supporting agencies are as agreed within the South Gippsland Shire MEMP, EMMV (Part 7 'Emergency Management Agency Roles'), State Flood Emergency Plan and Regional Flood Emergency Plan.

3.1.3 Municipal Emergency Coordination Centre (MECC)

If a MECC is established for a flood event, VICSES will provide an EMLO.

The VICSES RDO / ICC will liaise with the MECC directly.

If an Incident EMT is established, the Municipality will maintain involvement in the Incident EMT.

The function, location, establishment and operation of the MECC will be as detailed in the South Gippsland Shire MEMP.

3.1.4 Escalation

Most flood and storm 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 the EMMV ('State Emergency Response Plan' – section 3.5).

Local escalation arrangements will be detailed in an attachment to this plan once Council, VICSES, VICPol and VICRoads conduct local workshops.

The six Gippsland Municipalities have a resource sharing agreement in place for emergency events as detailed in the MEMP.

3.2 Strategic Control Priorities

To provide guidance to the Incident Management Team (IMT), the following strategic control priorities shall form the basis of incident action planning processes:

1. Protection and preservation of life is paramount - this includes,
 - a. safety of emergency services personnel and
 - b. safety of community members including vulnerable community members and visitors/tourist located within the incident area;
2. Issuing of community information and community warnings detailing incident information that is timely, relevant and tailored to assist community members make informed decisions about their safety;
3. Protection of critical infrastructure and community assets that supports community resilience;
4. Protection of residential property as a place of primary residence;

-
5. Protection of assets supporting individual livelihoods and economic production that supports individual and community financial sustainability; and
 6. Protection of environmental and conservation values that considers the cultural, biodiversity, and social values of the environment.

Circumstances may arise where the Incident Controller is required to vary these priorities, with the exception being that the protection of life should remain the highest. This shall be done in consultation with the State Controller and relevant stakeholders based on sound incident predictions and risk assessments.

3.3 Command, Control & Coordination

The Command, Control and Coordination arrangements in this MFEP must be consistent with those detailed in State and Regional Flood Emergency Plans. For further information, refer to sections 3.4, 3.5 & 3.6 of the EMMV.

3.3.1 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 7.1 of the EMMV prepared under the *Emergency Management Act 1986 (as amended)*, identifies VICSES as the Control Agency for flood. It identifies DSE as the Control Agency responsible for “*dam safety, water and sewerage asset related incidents*” and other emergencies

All flood response activities within the South Gippsland Shire including those arising from a dam failure or retarding basin / levee bank failure incident will therefore be under the control of the appointed Incident Controller, or his / her delegated representative.

3.3.2 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 or severe storm event on the advice of the Bureau of Meteorology (or other reliable source) that such an event will occur or is occurring. The Incident Controller responsibilities are as defined in Part 3.5 of the EMMV

3.3.3 Incident Control Centre (ICC)

As required, the Incident Controller 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 Incident Control Centre locations are

- **Level 1** – Local VICSES Unit
- **Level 2** - VICSES East Region Headquarters, 82a Moore St Moe or VICSES East Region Office, 130 Macleod Street, Bairnsdale
- **Level 3** – Multi Agency control facility, Franklin Street, Traralgon or VICSES East Region Office, 130 Macleod Street, Bairnsdale

3.3.4 Divisions and Sectors

To ensure that effective Command and Control are in place, the Incident Controller may establish Divisions and Sectors depending upon the complexity of the event and resource capacities. SES identified location for Divisional Command is:

- **Leongatha SES Unit LHQ or**
- **Leongatha CFA Operations Office.**

3.3.5 Incident Management Team (IMT)

The Incident Controller will form an Incident Management Team (IMT). Refer to 3.5 of the EMMV for guidance on IMT's and Incident Management Systems (IMS's).

3.3.6 Emergency Management Team (EMT)

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

Organisations, including South Gippsland Shire, required within the EMT 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 3.5 of the EMMV for guidance on EMTs.

3.3.7 On Receipt of the First Flood Watch / Severe Weather Warning

South Gippsland Shire Council will operate as defined within their Emergency Response Procedures.

The **VICSES** Incident Controller/ RDO will:

- Ensure flood bulletins and community information are prepared and issued to the community;
- Notify and brief appropriate officers, this includes (if established) Regional Control Centre (RCC), State Control Centre (SCC), Council and other emergency services through the EMT;
- Assess ICC readiness (including staffing of IMT and EMT) and open if required;
- Review intelligence to assess likely 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;
- 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; and
- Develop and issue situation report, if required.

3.3.8 On Receipt of Subsequent Flood Watch / Severe Weather Warning

South Gippsland Shire Council will operate as defined within their Flood Response Standard Operating Procedures.

The **VICSES** Incident Controller/ RDO will:

- Continue to review intelligence to assess likely consequences;
- Determine what the at-risk community need to know and do as the event develops;
- Continue to warn the at-risk community including ensuring that an appropriate warning and community information strategy is implemented;
- Liaise with relevant asset owners as appropriate (i.e. water and power utilities);
- Implement response strategies as required based upon consequence assessment;
- Continue to monitor the situation – www.bom.gov.au/vic/flood/; and
- Continue to undertake reconnaissance of low-lying areas.

3.4 Community Information and Warnings

The **BoM** has the responsibility for issuing Flood and Severe Weather Warnings.

VICSES, as the Control Agency, co-ordinates further community messaging.

Council has the responsibility to assist VICSES to warn individuals within the community including activation of flood warning systems, where they exist.

Other agencies such as **CFA**, **DSE** and **VICPOL** may be requested to assist VICSES with the communication of community flood warnings.

In cases where severe flash flooding is predicted, dam failure is likely or flooding necessitating evacuation of communities is predicted, the Incident Controller may consider the use of the Emergency Alert System and Standard Emergency Warning System (SEWS).

The **Department of Health** will coordinate information regarding public health and safety precautions.

Guidelines for the distribution of community information and warnings are contained in the State Flood Emergency Plan.

Community information and warnings will be targeted at local, regional and state wide needs and may include:

- Emergency Alert;
- Radio and Television;
- Verbal Messages (i.e. Doorknocking);
- Agency Websites;
- VICSES Flood Storm Information Line;
- Variable Message Signs (i.e. road signs);
- Community meetings & newsletters; and
- Social media.

Refer to Appendices C and E for the specific details of how community information and warnings may be provided.

3.5 Media Communication

The Incident Controller through the Public Information Unit established at the ICC will manage Media communication. If the ICC is not established the RDO will manage all media communication.

3.6 Rapid impact assessment

Rapid impact assessment can be conducted in accordance with part 3 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 DHS and recovery agencies.

3.7 Preliminary Deployments

When flooding is expected to be severe enough to cut access to towns, suburbs and/or communities, the Incident Controller 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.

3.8 Response to Flash Flooding

Emergency management response to flash flooding should be consistent with the guidelines within the State Flood Emergency Plan.

Local response to flash flooding is currently managed as the event occurs. Council, VICSES and VicPol are conducting a workshop to detail co-ordinated local response information.

3.9 Evacuation

VicPol is the control agency responsible for evacuations. The decision to recommend evacuation to VicPol rests with the Incident Controller. Once the decision is made, VicPol are responsible for the management of the evacuation process. VICSES and other agencies will assist where practical.

VICSES is responsible for the development and communication of evacuation warnings.

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

Refer to section 3.8 of the EMMV and the Evacuation Guidelines for guidance of evacuations for flood emergencies.

Council, VicSES and VicPol will be conducting evacuation planning as part of the Resilient Communities and CERA processes in the near future.

3.10 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.

3.11 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 and approval of the Incident Controller.

3.12 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.

3.13 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.

Each SES Unit maintains a small stock of sandbags, back-up supplies are available through the VICSES Regional Headquarters. The Incident Controller 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. SGSC Depot will store a pallet of 1,000 sandbags specifically for SES use.

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

Refer to Appendix C Plan for further specific details of essential infrastructure requiring protection.

3.14 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.

3.15 Road Closures

South Gippsland Shire and VicRoads 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.

South Gippsland Shire will advise VicRoads as to the need or advisability of erecting warning signs and / or of closing roads and bridges under its jurisdiction.

South Gippsland Shire will advise VicRoads of all road closures within Council's jurisdiction.

VicRoads are responsible for designated main roads and highways and Councils are responsible for the designated local and regional road network.

VicRoads will communicate community information regarding road closures.

3.16 Dam Failure

DSE 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.

Major dams with potential to cause structural and community damage within the Municipality are listed in the attachments.

3.17 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 Gippsland Water and South Gippsland Water (South Gippsland Shire in relation to septic tanks) 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; and
- Advise the ICC in the event of inundation of critical sewerage assets.

The MERO or ICC will seek advice from the South Gippsland Shire Environmental Health Officer on the appropriate responses to the community in regards to providing information on possible water supply contamination and the safety of the drinking water supply. However, it should be assumed that if there is flooding, there will be some contamination.

Details on areas with onsite wastewater management systems (commonly known as septic tank systems) are described in the attachments to this plan.

3.18 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. EMERGENCY RELIEF & RECOVERY ARRANGEMENTS

4.1 General

Relief and recovery arrangements within the South Gippsland Shire are detailed in the South Gippsland Shire MEMP and/or the Relief and Recovery Sub-plan.

4.2 Emergency Relief

The decision to recommend the opening of an emergency relief centre rests with the Incident Controller. Incident Controllers are 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 4.4 of the EMMV for details of the range of emergency relief services that may be provided.

Details of the relief arrangements are available in the MEMP / Relief and Recovery Plan.

4.3 Animal Welfare

Matters relating to the welfare of livestock, companion animals and wildlife (including feeding and rescue) are to be referred to DPI.

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

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

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 Section 3.10 of the EMMV.

South Gippsland Shire Flood Emergency Plan - Version 1.4

ATTACHMENT 01

APPENDICES A-F



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ASSOCIATED REPORTS

- | Flood Management Plan for South Gippsland Shire Council, Melbourne Water and West Gippsland CMA
- | Strategic Flood Intelligence Report – South Gippsland Basin
- | Flood Warning Data Collection Network Map - South Gippsland Basin, Bureau of Meteorology
- | Department of Primary Industries website for fishing anglers
<http://www.dpi.vic.gov.au/fisheries/recreational-fishing/inland-angling-guide/south-gippsland-west/angling-waters>
- | Tarwin Lower Flood Study, Water Technology, 2007
- | River Palms Estate Tarwin Lower Flood Assessment, Water Technology (2007)
- | Know Your River, Bass River, Melbourne Water
- | A Report on the South Gippsland Water Supply Catchments, Land Protection Division, Department of Conservation, Forests & Lands, October 1987 (Creek, Master)
- | Enhancing the Strzeleckis, Agnes River Catchment, WGCMA
- | Community Participation Model for Flood Monitoring, Awareness and Response in Rural Areas: A Case Study on the Powlett River, WGCMA, May 2003
- | Flood Data Transfer Project – Flood Data and Flood Planning maps as well as Flood Mapping and River Basin Reports, Department of Natural Resources and Environment (DNRE) 2000
- | Regional Floodplain Management Plan, WGCMA, 2000

ACCURACY & CONFIDENTIALITY

Use this information as a guide to the possible effects of a flood. This card is based on estimates of flood behaviour and particular effects may occur at heights different from those indicated here. They may also occur at slightly different heights in different floods. This card may contain sensitive information about the effects of flooding on private property. Specific reference to private addresses or businesses must be made directly to owners or other emergency services but not via broadcast or print media.

APPENDIX A – FLOOD THREATS

OVERVIEW OF RIVER SYSTEMS

GENERAL

South Gippsland Shire is located approximately 100 kilometres south-east of Melbourne, and comprises a total area of 3,295 km². The Shire is home to over 27,000 people, residing in approximately 10,451 households (ABS 2011). Major towns in the Shire include Leongatha, Korumburra, Mirboo North and Foster.

The Shire is bordered by Bass Coast Shire to the west, Cardinia and Baw Baw Shires to the north, Latrobe and Wellington Shires to the east, and Bass Strait to the south. Wilson's Promontory is a key feature of the area, and forms much of the southern boundary. Adjoining the Promontory is Corner Inlet, a protected Ramsar site of significance to migratory birds and a key tourist location. Other key features include the Strzelecki Ranges at the north of the municipality, and Andersons Inlet and Sandy Point along the coast.

The steep ranges to the north contain the headwaters of a number of waterways in the Shire, and the slopes that run through the region result in patches of rolling hills and steep farmland. Other areas in South Gippsland are very flat, especially near the coast, where the lowlands extend for many kilometres.

An associated risk for South Gippsland Shire is the high frequency of landslips associated with heavy rainfall and flooding events.

DESCRIPTION OF MAJOR WATERWAYS AND DRAINS

The main waterways in the Shire from west to east are:

- | **Bass River** (Little Bass River) upstream of the South Gippsland Highway
- | **Powlett River** (Foster, Bridge, Lance, West & Woolshed Creeks upstream of Outtrim, Inverloch & Scotts Estate Rds)
- | **Tarwin River** (East Branch, West Branch, Watkins, Berrys, Toomey, Wikkur, Ruby, Coalition, Stony, Fish, Bridge & Bald Hill Cks)
- | **Darby River**
- | **Stockyard Creek**
- | **Franklin River** (Little Franklin River, Deep Creek)
- | **Agnes River**
- | **Lang Lang River** (upper parts)

Maps showing the major waterways are provided in Appendix F.

BASS RIVER

The **Bass River** is a relatively short (30km) coastal river that rises in the **Strzelecki Ranges** to the south of Poowong in the **South Gippsland Shire** and flows in a south westerly direction through the wide, flat Bass Valley and estuary in the Bass Coast Shire and into **Western Port Bay** near the town of **Bass**.

The area is characterised by steep slopes and erosion and is subject to tidal influence as far upstream as Bass township. There are many farm dams in the catchment restricting flows into the river until the dams are full, this can cause very different outcomes during a heavy rainfall event if the dams are full as opposed to empty.

At the top of the river, **Bellview Creek** and **Little Bass River** join below **Poowong** and become the **Bass River**. It then flows west and then south west toward **Loch** and then **Almurta**. From Almurta the terrain is relatively flat farmland. There is a small deep reservoir on the river called the Poowong Reservoir.

POWLETT RIVER

The **Powlett River** rises as many tributaries in steep farmland in the **Strzelecki Ranges** south of **Korumburra** near **Outtrim** in **South Gippsland Shire** before flowing south into **Bass Coast Shire**. It has a catchment area of around 555km². Its main tributary is **Foster Creek** which rises below **Holmes Hill** south of **Korumburra** and flows south through hilly rural areas, just to the west of **Kongwak** where it joins **the Powlett River** before it swings west south of **Korumburra**. The River continues in its westerly path, crosses the **Bass Hwy** just east of **Dalyston**, is joined by a small tributary called **Bridge Creek** and then flows into **Bass Strait**. Other tributaries include **Lance Creek**, **West Creek** and **Woolshed Creek**.

The catchment extends over two municipalities; the Shires of South Gippsland and Bass Coast. The South Gippsland Shire generally covers the catchment to the east of Foster Creek and includes the townships of Kongwak, Outtrim, Jumbunna and Korumburra. The Bass Coast Shire covers the catchment area west of Foster Creek and includes the townships of Inverloch, Wonthaggi, Archies Creek and Dalyston.

The Powlett River has a significant floodplain area and land use within the catchment is predominantly agriculture-based. The catchment consists of three major physiographic zones as follows:

- | **The South Gippsland Highlands zone** which is characterised by a highly dissected ridge and valley relief.
- | **The Powlett River plains zone** which is characterised by flat to gently undulating terrain. The Plains contain major drainage systems located south of the Powlett River that were established to allow farming of waterlogged and flood prone land. The drainage system consists of a number of major drainage lines that run from east to west, from about the Kongwak-Inverloch Road and join the Powlett River just west of the Korumburra-Wonthaggi Road. The mid-section of the Powlett River is perched above the floodplain and during flood events floodwaters break the banks and flow out across the plain. In some places, flood flows can be up to approximately 2kms away from the river. Old abandoned river courses, which are apparent on the floodplain, provide evidence that the river is subject to periodic changes in course due to avulsion (river breakaway development).
- | **The River Mouth zone** which occurs between the downstream end of the alluvial Powlett plains zone and the coast. This part of the river is influenced by tides and storm surge as well as the natural processes of sand transport that periodically block the mouth of the river. These natural processes can cause isolated flood events, which inundate farmland within the zone. When there is a significant blockage, the mouth of the river is excavated to reopen the entrance and release the built up water. The works are usually initiated by local landholders in close consultation with Parks Victoria who are responsible for management of the coastal foreshore.

According to the WGCMA, a significant flood on the Powlett River is defined as “when floodwaters reach the underside of the Loch-Wonthaggi Road Bridge over the Powlett River”.

TARWIN RIVER

The **Tarwin River** is South Gippsland Shire’s primary river system with a catchment area of approximately 1500km², predominantly rural with small pockets of residential land use. It flows south from the Strzelecki Ranges and discharges at the eastern end of **Andersons Inlet**, a shallow estuary connected to **Bass Strait**. Major tributaries include the **Tarwin River East Branch** and **Fish Creek**.

Tarwin River East Branch originates to the east of the township of **Dollar** in the mountains that form the Shire’s eastern boundary. The river then heads north through **Tarwin East** and on to **Mirboo** before swinging around the north of the township and heading south through a valley, breaking out on to cleared farmland north of **Dumbalk** where the river is up to 12m wide with slow flowing water when not in flood. The river continues south until it meets up with the **West Branch** near Meeniyon to form the **Tarwin River**.

Tarwin River West Branch extends far to the north, rising as a number of tributaries at 500m altitude on the southern slopes of the Strzelecki Ranges to the south of Mount Worth State Park. It flows 18km through mostly steep, cleared farmlands with the small **Watkins Ck** flowing through steep scrub-covered farmland and joining the river at **Allambee South**. Tarwin River West Branch is further fed by **Berrys**, **Toomey**, **Wilkur**, **Ruby** and **Coalition Creeks** on its way south. Allambee South to Meeniyon is 35km in length and generally flows through flat and rolling farmland.

Berry's Creek is a major tributary of the West Branch flowing through moderately sloping farmland in its upper and middle reaches onto flat farmland near the Strzelecki Highway, the creek varies from a 2-6m channel width upstream to a 3-8m width downstream and joins the West Branch just west of **Berrys Creek** township.

Wilkur Ck has a low flow in summer and may dry up completely.

Ruby Ck has four domestic water reservoirs (including Sir Herbert Hyland Dam and Western Reservoir) situated in steep gullies in open hilly country and totalling 2,235ML. Ruby Ck flows into **Coalition Ck** just north of **Leongatha**.

Coalition Ck has two domestic water reservoirs on stream which influence flow and are controlled by South Gippsland Water.

The confluence of the East & West Branches occurs near the town of **Meeniyan**, from which the main **Tarwin River** continues for another 30km through flat farmland to the estuary. In this reach, it is fed by **Stony, Bridge, Fish** and **Bald Hill Creeks**.

Fish Creek is a major contributor to Tarwin River passing around the township of Fish Creek and through open farmland until it joins **Bald Hill Creek** just east of the confluence between **Bald Hill Creek** and **Tarwin River** between **Tarwin Middle** and **Tarwin Lower**.

The river then heads west through flat open river flats, passing around **Tarwin Lower**, flooding many local roads and then flowing into an extensive estuary **Andersons Inlet** and eventually into **Bass Strait**. The lower reaches of the Tarwin and other waterways that outfall into the bays can be affected by coastal and tidal influences (eg high tides and storm surges).

DARBY RIVER

The **Darby River** rises in the Wilsons Promontory National Park to the north of **Tidal River** and flows generally to the west to enter Bass Strait. As with the Tidal River, the Darby River is in relatively pristine condition, with the only human interference being the Wilsons Promontory Road Bridge at the estuary. Heavy rains in March 2011 caused unprecedented flooding of the river, damaging the bridge and stranding hundreds of campers in the National Park, who had to be evacuated by helicopter.

STOCKYARD CREEK

Stockyard Creek rises just north of **Foster** and runs south through the township. It continues to flow south through predominantly rural land until it flows into Bass Strait via **Corner Inlet** just west of **Port Franklin**.

FRANKLIN RIVER

The **Franklin River** rises in the **Strzelecki Ranges** south of **Gunyah Gunyah** and flows south through steep mountainous terrain in the **Strzelecki State Forest** until it breaks out into open farmland as it crosses the South Gippsland Highway west of **Toora**. It then joins with **Deep Creek**, which is a fast flowing stream that rises in the forested hills upstream of the Foster-Mt Best Rd, and through the township of **Port Franklin** and into Corner Inlet and onto Bass Strait.

AGNES RIVER

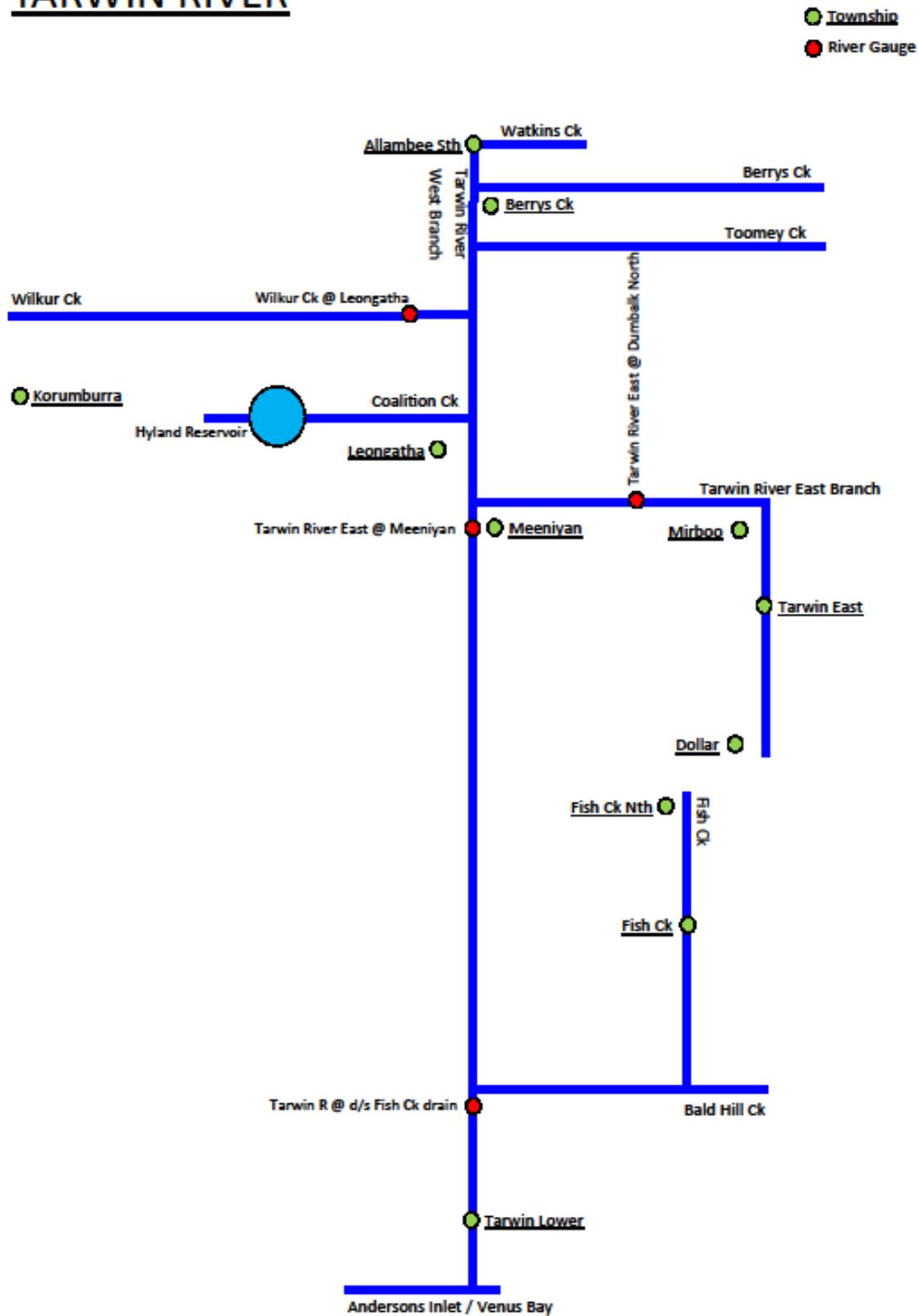
Agnes River rises just within Wellington Shire in the Strzelecki Ranges north east of **Gunyah Gunyah**. It flows first east and then south into South Gippsland Shire. The river flows through the mountains forming the 59m drop **Agnes Falls** upstream of the small township of **Agnes** before making its way into **Corner Inlet** and onto **Bass Strait**.

South Gippsland Shire contains 140 names waterways, including creeks and river systems. A listing of those waterways, taken from the Flood Management Plan, is below.

Adams Creek	Fish Creek	Omahoneys Creek
Adams Creek North Branch	Fishermans Creek	Peacock Road Drain
Agnes River	Foster Creek	Pebble Creek
Allsop Creek	Franklin River	Pheasant Creek
Amber Creek	Frasers Creek	Picnic Creek
Bald Hill Creek	Freshwater Creek	Poor Fellow Me Creek
Banksia Creek	Golden Creek	Pound Creek
Barry Creek	Good Creek	Powlett River
Bass River	Growler Creek	Red Bluff Creek
Battery Creek	Gwyther Creek	Richards Creek
Bawdens Creek	Hobbs Creek	Roaring Meg Creek
Bear Creek	Hoddle Creek	Ruby Creek
Bellview Creek	Jubilee Creek	Screw Creek
Bennison Creek	Kewita Creek	Sealers Creek
Berrys Creek	Lamont Creek	Second Creek
Billy Creek	Lance Creek	Shady Creek
Black Fish Creek	Lang Lang River	Silver Creek
Black Spur Creek	Leura Creek	Small Creek
Blackwood Creek	Lilly Pilly Gully	South Point Creek
Boolarra Creek	Little Bass River	Stockyard Creek
Boyle Creek	Little Franklin River	Stony Creek
Bridge Creek	Little Lang Lang River	Tarwin River
Brookes Creek	Little Lang Lang River Sth	Tarwin River East Branch
Buffalo Creek	Little Morwell River	Tarwin River West Branch
Cascade Creek	Little Narracan Creek	Telfer Creek
Cherokee Creek	Little Ruby Creek	Ten Mile Creek
Chinaman Creek	Livingstone Creek	Tidal River
Chitts Creek	Lorkin Creek	Tin Mine Creek
Clark Creek	Macpherson Creek	Titania Creek
Clear Creek	Mcalister Creek	Toomey Creek
Coal Creek	Middle Creek	Township Creek
Coalition Creek	Miranda Creek	Turtons Creek
Cooks Creek	Misery Creek	Walkleys Creek
Coral Fern Gully	Monkey Creek	Walla Walla Creek
Cornelian Creek	Moonlight Creek	Waratah Creek
Cove Creek	Morgan Creek	Watkins Creek
Cow Creek	Morwell River	Wattle Creek
Darby River	Morwell River East Branch	West Creek East Branch
Dead Horse Creek	Morwell River West Branch	Whisky Creek
Deadlock Creek	Mt View Creek	White Creek
Deep Creek	Mt View Creek South Branch	Wild Dog Creek
Dingo Creek	Muddy Creek	Wilker Creek
Dividing Creek	Narracan Creek	Wilkur Creek
Eliza Creek	Ness Creek	Woomera Creek
Elizabeth Creek	Nicoll Creek	
Enclave Creek	Nine Mile Creek	
Ferr Creek	Ogrady Creek	
First Bridge Creek	Old Hat Creek	

SCHEMATIC DIAGRAM – TARWIN RIVER

TARWIN RIVER



FLOOD RISKS

RIVERINE FLOODING

There is little recognised riverine flooding risk in South Gippsland Shire, with the majority of impact being to low-lying rural land and roads. Riverine flooding can cause isolation of some towns as the only access/egress road is cut by flood waters. An isolation risk table is provided later.

The predominant riverine flooding risk is on the Tarwin River at Tarwin Lower, Fish Creek and Meeniyan and associated rural areas. Riverine floods within the Shire generally occur as a result of-

- | Moist warm airflow from northern Australia bringing moderate to heavy rainfall over a period of 12 hours or more following a prolonged period of general rainfall. The period of general rainfall “wets up” the catchments and (partially) fills both the on-stream dams and the natural floodplain storage. These combine to increase the runoff generated during the subsequent period of heavy rainfall.
- | Successive cold fronts that bring periods of rain that wet up the catchments and prime them for flooding from a further front or complex low pressure system that is perhaps slower moving and/or brings heavier rainfall.
- | A low pressure system (often intense and known as an ‘east coast low’) that develops within eastern Bass Strait or over the Tasman Sea and directs moist air for a period of 12 hours or more onto South Gippsland. The lifting that occurs as it travels inland results in heavy rain and possible flooding.

FLASH FLOODING & OVERLAND FLOWS

Short duration, high intensity rainfall (usually associated with thunderstorms) can cause flash flooding throughout South Gippsland. Such events, which are mainly confined to the summer months, do not generally create widespread flooding since they only last for a short time and affect limited areas. Flooding from these storms occurs with little warning and localised damage can be severe.

Flash flooding can cause many roads to experience high velocity flows for a short period and can trigger landslips undermining roads and dams. Towns such as Fish Creek incurred residential inundations and required evacuation (2011) with flash flooding. While the South Gippsland Highway near Meeniyan can be affected by high flows, the town of Meeniyan is generally not affected.

High intensity rainfall such as associated with thunderstorms giving average rainfall rates of more than around 25mm/hour for 30 minutes or more is likely to lead to flash flooding and / or overland flows, across the urbanised parts of the shire.

TIDAL FLOODING & STORM SURGES

Moderate to heavy rainfall, coupled with a high or incoming tide and / or storm surge associated with an extra low pressure system and perhaps also on-shore winds, can exacerbate flooding within the coastal areas of the Shire or create areas of flooding in and around the drainage network. Due to the proximity of the Shire to the Bass Strait Coast, tidal flows may inhibit the ability of the waterways and stormwater drains to discharge runoff, while extreme storm events can cause backflow to the point where water surcharges back above ground around the drainage pits and channels. Townships expected to be vulnerable to sea level rise include Port Welshpool, Tarwin Lower and Waratah Bay. The single access route to Venus Bay is also vulnerable to flooding, both riverine and coastal.

RURAL FLOOD RISK

There are a number of areas that have significant rural flood risk. Though these areas are not highly populated, rural properties are susceptible to isolation or inundation. Areas around:

- | **Corner Inlet:** particularly around Port Welshpool & south of Toora
- | **Tarwin River:** Berrys Ck, Mardan Sth, Mirboo Nth, Tarwin Lower, Fish Creek
- | **Bass River:** Loch and on the floodplain between Poowong and Loch
- | **Franklin River:** Port Franklin

HEALTH & ENVIRONMENTAL RISKS

- Contamination of water supply to the death of livestock
- Removal of mould in houses that have been effected by floods
- Possible Asbestos contamination with damaged buildings
- There are many septic tanks in the rural areas that may be inundated by floodwaters and farm chemicals stored in farm sheds on the floodplain.

Over 7500 onsite wastewater management systems (commonly known as septic tank systems) are in use within South Gippsland. The core properties of 9 South Gippsland townships are serviced by sewer, the remaining areas beyond these properties, including 17 townships, must rely entirely on onsite wastewater management by septic tank systems. These Townships include; Nyora, Loch, Poowong, Bena, Jumbunna, Kongwak, Korumburra, Leongatha, Koonwarra, Mirboo North, Dumbalk, Meeniyan, Stony Creek, Buffalo, Fish Creek, Tarwin Lower, Venus Bay, Walkerville, Waratah Bay, Sandy Point, Yanakie, Foster, Port Franklin, Toora, Welshpool, Port Welshpool.

In South Gippsland the following townships contain Declared Sewerage Districts.

Sewered Townships	Authority
Foster, Korumburra, Leongatha, Meeniyan, Port Welshpool, Toora, Waratah Bay, and Welshpool	South Gippsland Water
Mirboo North	Gippsland Water
Nyora, Loch and Poowong are planned to be sewered by 2016/17.	Under development by South Gippsland Water
Loch, Nyora, Poowong	

Figure 1 - South Gippsland Water and Sewerage Services

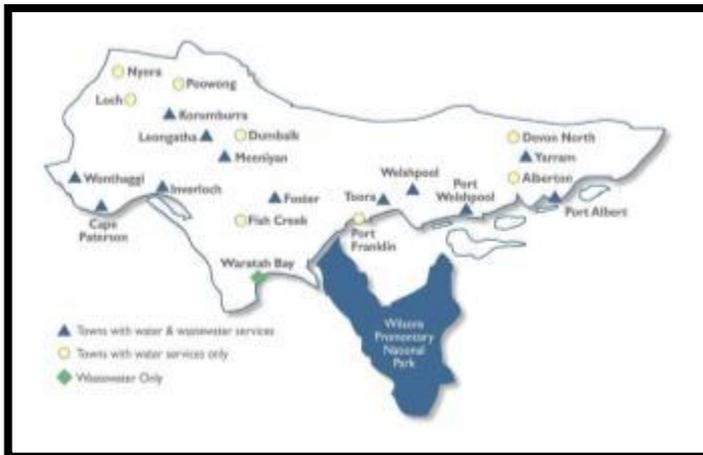
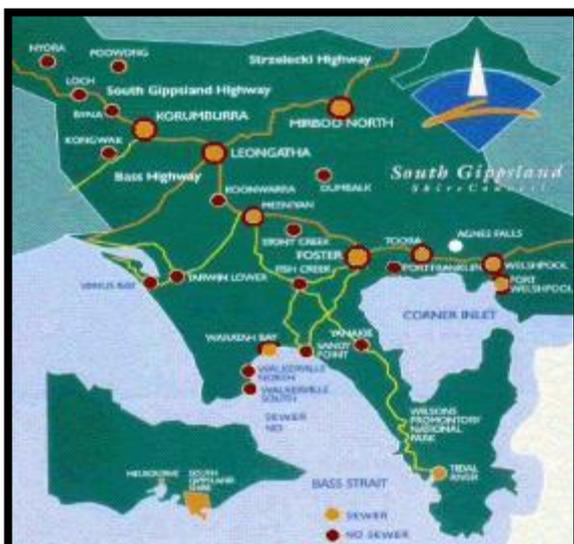


Figure 2 - South Gippsland Shire Council township location and wastewater status



PROPERTIES AT RISK

Approximately 3,000 properties are at risk within the municipality of riverine flooding using the 1 in 100yr ARI flood extents incorporating sea level rise to 2100.

While a flood study has been completed for Tarwin Lower (Water Technology, 2007) there is no information currently available on property floor levels or the likelihood of over-floor flooding within South Gippsland Shire.

Caravan Parks at Port Welshpool and Sandy Inlet are also at risk of being flooded during a 1% AEP event.

Community	Road	Impact	Riverine Flooding	Storm Surge	Flash Flooding
Toora	Grip Rd & Jetty Rd	Houses along these roads	X		X
Foster	Station Rd	Houses backing onto Stockyard Creek	X		X
Port Franklin	Tramway St	Houses above floor flooding		X	X
Waratah Bay	Brown St	Caravan Park			X
Waratah Bay	Gale St	Houses		X	
Fish Creek	Meeniyan-Promontory Rd	Houses between Williamson St & Farella Lane			X

ISOLATION RISK

Community	Road	Closure point	Riverine Flooding	Storm Surge	Flash Flooding
Venus Bay	Tarwin Lower Rd	West of Tarwin Lower	X	X	
Waratah Bay	Gale St	Waratah Bay		X	X
Sandy Point	Waratah Rd	West of Sandy Point			X
Tidal River	Wilson's Promontory Rd	North of Tidal River			X
Meeniyan	South Gippsland Hwy	Rural land around houses to the west of Meeniyan	X		

INDICATIVE FLOOD / NO FLOOD GUIDANCE TOOL

INTRODUCTION

The BoM does not currently provide flood forecasts for South Gippsland. All flood response actions must therefore be driven by local rainfall and / or river level observations.

Water level / flood gauges within South Gippsland are listed in Appendix A.

Rainfall data is available from a number of gauges within South Gippsland. Automatic weather stations (AWS) are operated by the BoM at Wilsons Promontory and Pound Creek. Data from these two stations are available from the BoM website at half hourly intervals.

INDICATIVE FLOOD BEHAVIOURS

In general, riverine floods rise and fall quickly in South Gippsland.

In very general terms, in the lower floodplain areas of the Tarwin and Powlett rivers, levels begin to rise around 18 to 24 hours after the start of heavy rainfall and peak within 30 to 36 hours for big floods and 2 to 3 days or more for smaller floods. The smaller waterways (eg Franklin, Agnes, Bass, Darby and Lang Lang) are likely to have response times in the order of 6-12 hours for big floods and 12 hrs for small floods.

Levels fall around a third the rate of rise – it takes roughly 3 times as long to fall as it does to rise. These general guidance timings will be influenced strongly by storm surge, if present.

USING THE TOOL DURING AN EVENT

If rainfall is from any event other than an East Coast Low, it is suggested that rainfall data from the Pound Creek site (or alternative locations closer to areas considered likely to experience flooding due to heavy rain) should be used to determine an appropriate rainfall depth for use in the Indicative Flood / No Flood guidance tool provided below.

If rainfall is from an East Coast Low, it is suggested that an average of the Wilsons Promontory and Pound Creek rainfalls should be used for all periods for which the Wilsons Promontory rainfall is higher. Again, alternative locations closer to areas considered likely to experience flooding could be used.

Two approaches can be used during a rainfall event to determine an indication of the likelihood and severity of flooding. Both approaches can be used simultaneously using the same copy of the tool. **Unless there are unusual circumstances, actions as per the appropriate Flood Intelligence Card should be initiated as soon as the tool suggests flooding is likely.** Response can be escalated if the tool indicates an increase in the expected severity of flooding.

| **Approach 1:** Using the total rainfall depth obtained from the start of the event (discount early drizzle or very light rain), plot the rainfall depth against elapsed time on a copy of the tool. Assess the likelihood and expected severity of flooding from the curves with due regard for included notes.

| **Approach 2:** Discount the early lighter rain from consideration (i.e. begin calculating rainfall depth from start of heavy rain) and plot depth against time on a copy of the tool. Assess the likelihood and expected severity of flooding from the curves with due regard for included notes.

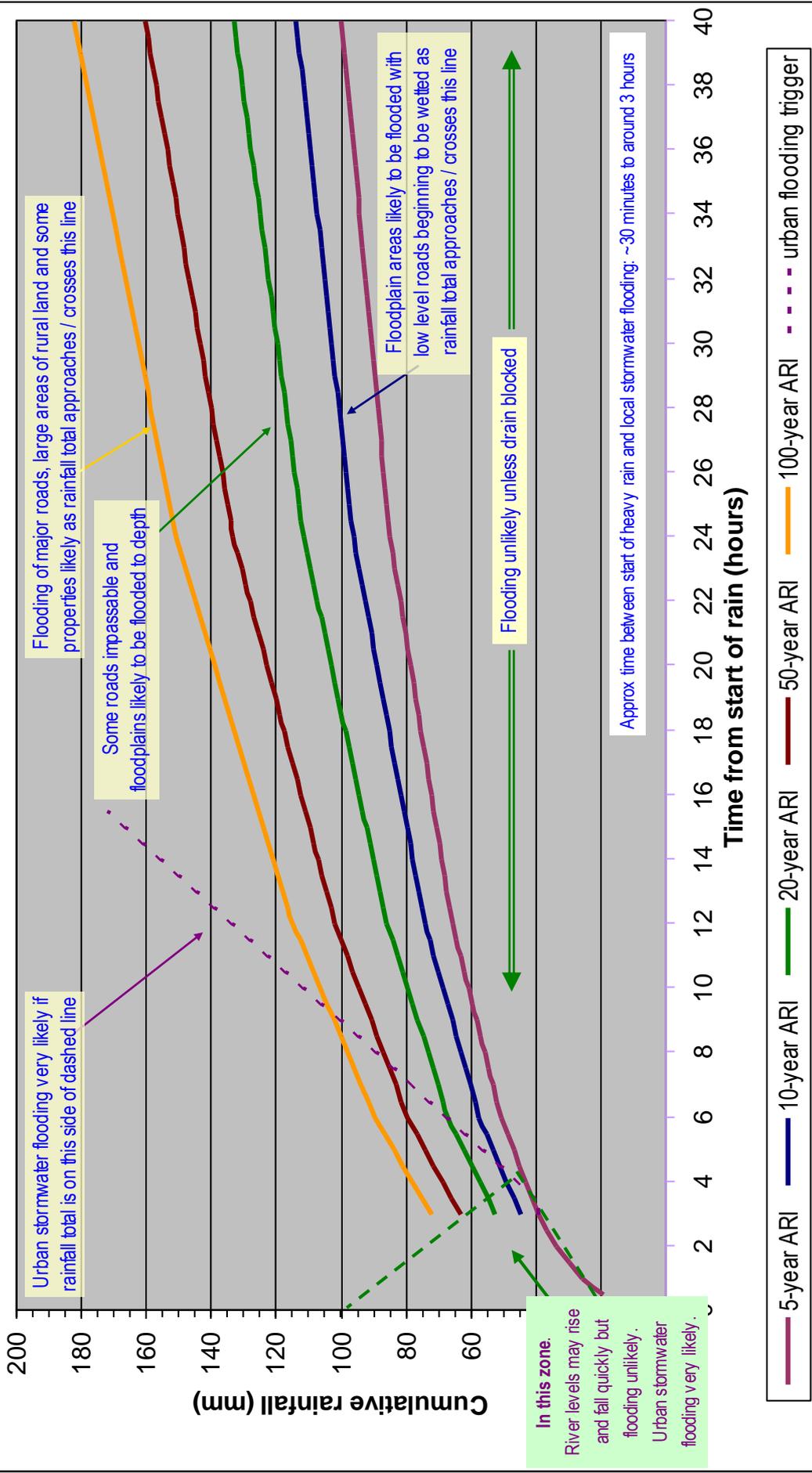
CAUTION. The tool is based on a number of gross assumptions and generalisations. It is indicative only and while it will not always indicate flooding / no flooding correctly, it will give a heads up to severe flooding. The tool is not location specific and does not enable accurate predictions of expected flooding, peak flood heights, the time of flood peak, the severity of expected flooding or the likely consequences.

AFTER A FLOOD EVENT

After a flood event, plot the event rainfall depth (with date) on the tool and include an overview of the event, including antecedent conditions, in Appendix A of this MFEP.

Indicative guidance for likelihood of flooding in South Gippsland based on rainfall

This guide assumes that rainfall affects the whole catchment and is not localised heavy falls. For very wet rural catchments, move up one level. For example, if rainfall is on the 10-year curve and the catchment is very wet, refer to the 20-year consequences.



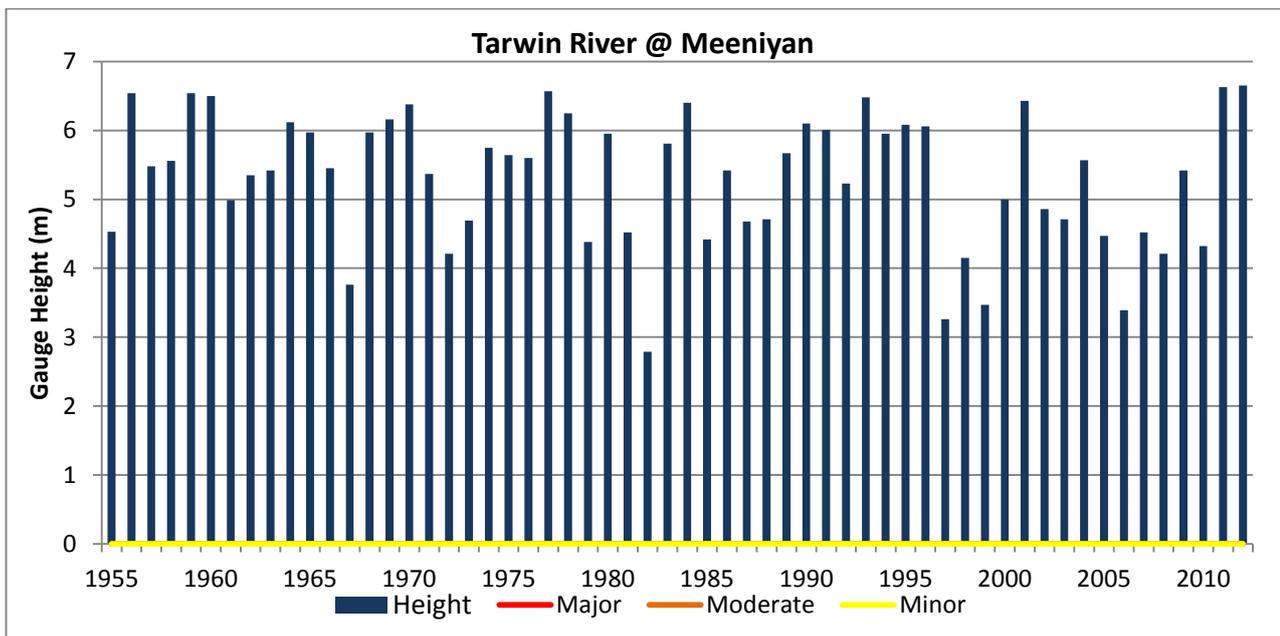
HISTORICAL FLOODS

Significant floods that have occurred in South Gippsland Shire are shown in the table below along with graphs showing annual maximum levels. Impacts of significant events are below the table and graphs.

TARWIN RIVER

Antecedent conditions have a large influence on the impact of 24hr rainfall figures.

EVENT	Wilkur Ck @ Leongatha	Tarwin R East @ Mirboo	Tarwin R East @ Dumblak Nth	Tarwin R @ Meenyan	East Tarwin Rain Gauge - 85227	# of days
1977 Jul	5.52	1.41	3.31	6.57	114.0	3
1978 Jun	4.08	3.08	5.55	6.25	86.6	2
1980 Jun	7.33	2.54	5.43	5.95	96.8	2
1983 May	2.61	1.70	4.58	4.66	112.6	2
1984 Jul	4.98	2.44	5.67	6.40	119.0	2
1984 Sep	5.92	1.62	4.26	6.11	61.0	2
1988 Dec	7.46	-	3.98	4.71	60.4	2
1989 Jun	6.24	-	4.20	5.46	80.0	2
1989 Oct	6.23	-	4.17	5.67	52.0	2
1990 Oct	6.60	-	4.06	6.10	62.6	2
1991 Sep	5.14	-	3.47	6.01	51.6	2
1993 Sep	5.47	-	5.73	6.48	100.2	2
1995 Nov	4.84	-	5.30	6.08	98.2	2
1996 Jul	6.21	-	4.82	6.06	63.6	1
2001 Aug	5.23	-	4.08	6.43	82.4	3
2009 Oct	5.84	-	1.50	5.42	42.0	2
2011 Apr	5.85	-	4.43	6.63	76.0	1
2011 Jun	4.68	-	1.99	5.67	39.6	2
2011 Jul	5.08	-	4.17	5.80	48.8	2
2012 May	7.47	-	3.35	6.21		
2012 Jun	6.80	-	5.41	6.65		
1 st on record	7.47	3.08	5.73	6.65		
2 nd on record	7.46	2.54	5.67	6.63		
3 rd on record	7.33	2.44	5.55	6.57		
4 th on record	6.80	1.70	5.43	6.48		

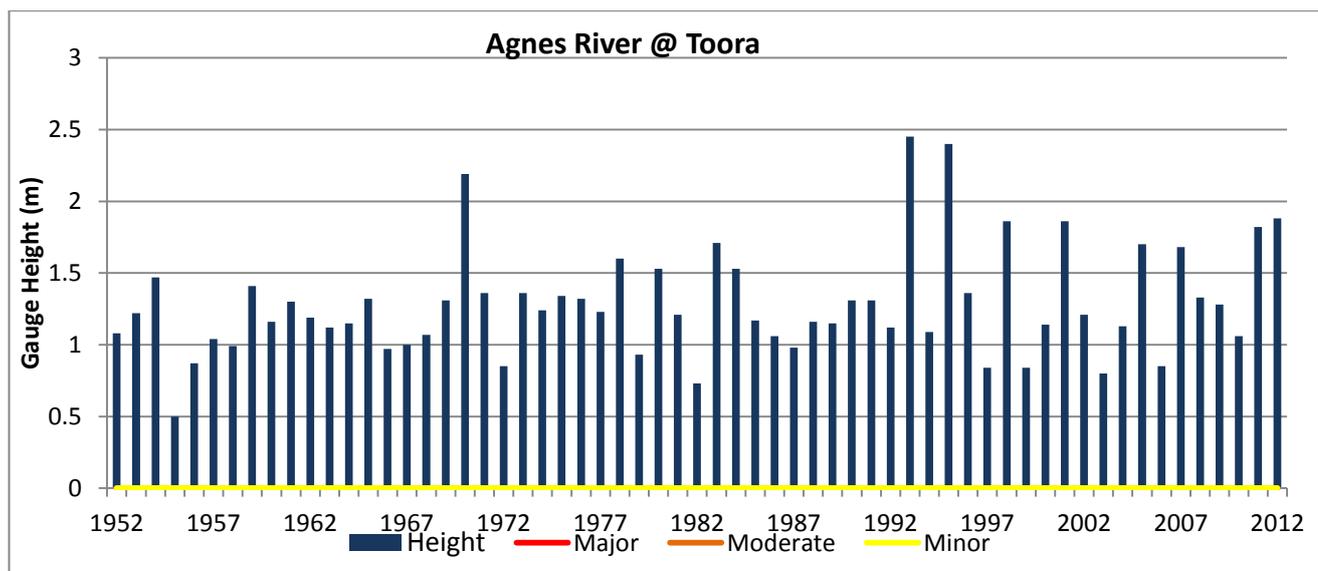


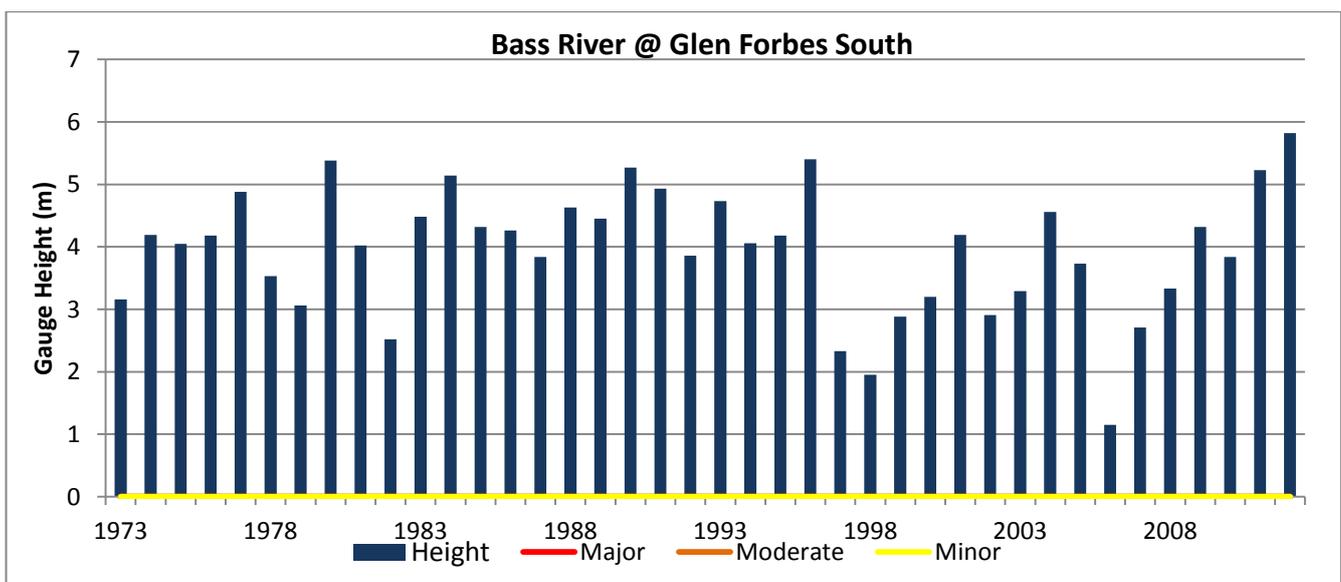
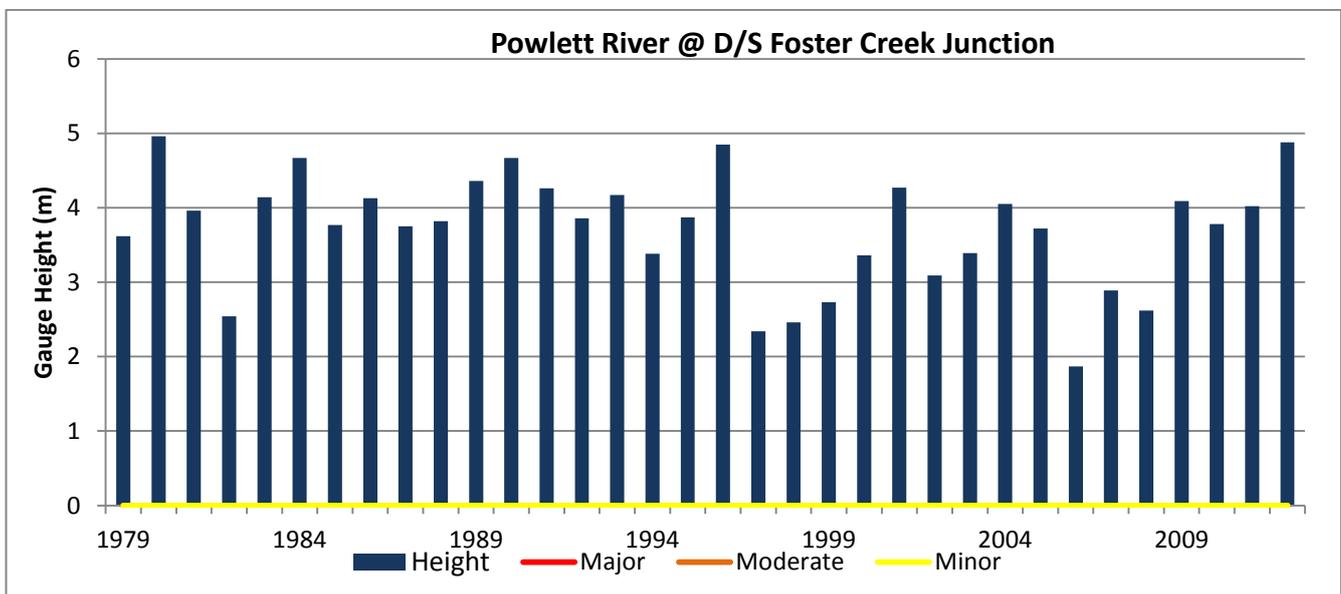
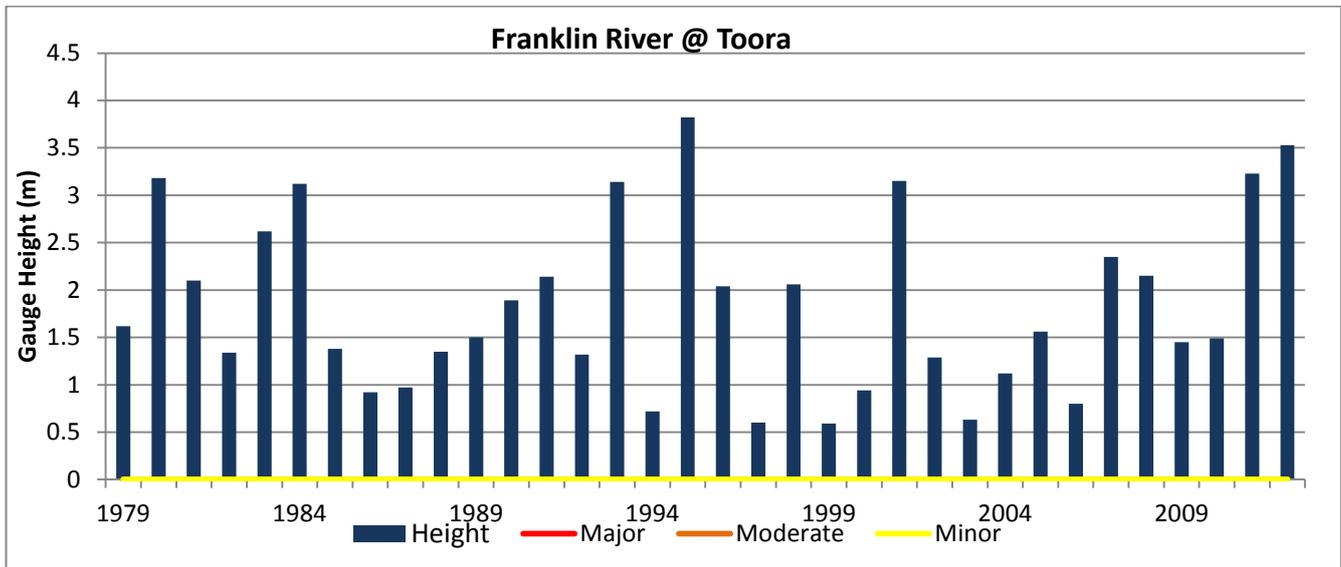
AGNES & FRANKLIN RIVERS

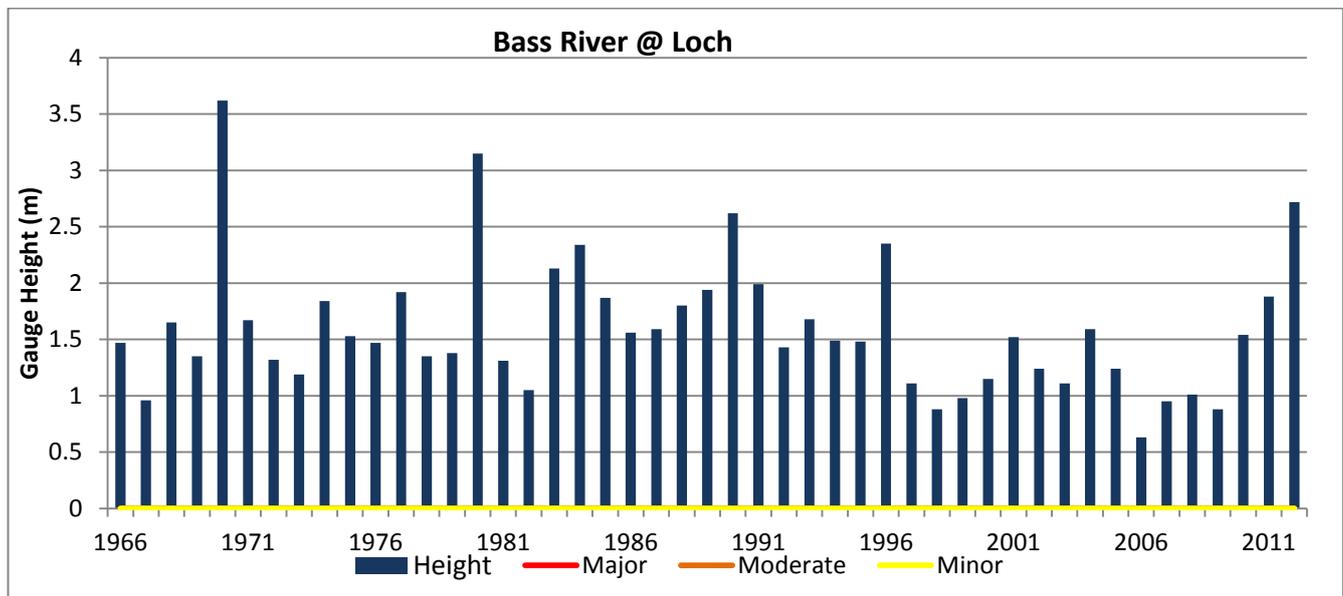
EVENT	Agnes R @ Agnes	Franklin R @ Toora
1970 Mar	2.19	-
1980 Jun	1.53	3.18
1983 Mar	1.71	2.37
1983 May	1.57	2.62
1984 Jul	1.53	3.12
1993 Sep	2.45	3.14
1995 Oct	1.97	2.21
1995 Nov	2.40	3.82
2001 Apr	1.86	3.15
2005 Feb	1.70	1.56
2011 Mar	1.43	2.67
2011 Jul	1.82	3.23
2012 May	1.47	2.00
2012 Jun	1.88	3.53
1 st on record	2.45	3.82
2 nd on record	2.40	3.53
3 rd on record	2.19	3.23
4 th on record	1.97	3.18

POWLETT & BASS RIVERS

EVENT	Powlett River @ d/s Foster Creek	Bass R @ Loch	Bass R @ Glen Forbes Sth
1980 Jun	4.96	3.15	5.38
1980 Jul	4.33	1.55	4.84
1983 Sep	4.14	2.13	4.48
1984 Jul	4.41	1.71	4.48
1984 Sep	4.67	2.34	5.14
1988 Dec	3.78	1.80	4.63
1989 Jun	4.02	1.84	4.25
1989 Jul	4.36	1.94	4.33
1989 Oct	3.93	1.93	4.45
1990 Oct	4.67	2.62	5.27
1991 Sep	4.26	1.99	4.93
1993 Sep	4.17	1.68	4.73
1996 Jul	4.85	2.35	5.40
2001 Aug	4.27	1.52	4.19
2004 Sep	4.05	1.43	4.50
2011 Apr	4.02	1.88	5.23
2011 Nov	2.98	1.77	5.05
2012 May	4.38	2.57	5.52
2012 Jun	4.88	2.72	5.82
1 st on record	4.96	3.15	5.82
2 nd on record	4.88	2.72	5.52
3 rd on record	4.85	2.62	5.40
4 th on record	4.67	2.57	5.38







HISTORICAL EVENTS

There are frequent small flood events in most years on the streams in South Gippsland.

NOVEMBER 1934

One of the most prominent recorded historical floods in the region occurred on the 29th of November 1934. Across the Port Phillip and South Gippsland regions, 350 mm was recorded over a 48-hour period, resulting in landslides, road closures and evacuations. 178mm of rain was registered in the Wonthaggi district in 27 hours, 127mm in the Lance Creek area from an individual storm. A journalist from the Powlett Express and Victorian State Coalfields Advertiser wrote, “The rivers and creeks, which were running bankers as a result of Wednesday’s storm, overflowed their banks and swamped thousands of acres of land along the Powlett and Bass Rivers. All the farmers on the river frontages have suffered considerably as a result of the storm” (Powlett Express, 1934).

The floods caused 36 deaths across south-east Melbourne, left 6,000 homeless and are noted as the region’s most destructive on record (Southern Ocean Exploration 2005). The damage to buildings, roads and infrastructure as a result of the flooding and subsequent landslips was unparalleled.

Many locals consider that it is unlikely that flood levels experienced in 1934 will be reached again, due to the numerous changes across the South Gippsland catchments over the last 70 years. They believe that land clearing and river and road works would now allow floodwaters to move and recede more quickly. An alternative view is that these same changes will cause increased flooding, due to the greater speed at which floodwaters now reach the lower flats.

1968 – 1990

In the Powlett River, a flood in the early 1980s came close to the levels described in 1934, but it did not cause the amount of damage experienced in 1934. Rainfall records indicate that, in addition to the events of 1934 and the early 1980s, major floods are also likely to have occurred in 1977, 1968 and 1952. There are also likely to have been a number of large floods in the late 1800s.

MARCH 2011

Flash flooding across South Gippsland Shire occurred on 22nd of March, 2011. In particular, flooding of Fish Creek (Tarwin River) caused evacuation and road closures. The surge in Fish Creek was attributed to 102mm of rain that fell at Fish Creek on 22nd as recorded at the BoM’s rainfall gauge (85040). This was only 1.1mm less than the all-time maximum daily rainfall depth recorded at Fish Creek. This flood event also affected the Darby River, and culminated in the closure of a number of roads around Yanakie, in particular the access road to the Promontory. Three metres of the Darby River bridge was washed away by the surging waterway, forcing the largest Australian air lift evacuation of stranded people since Cyclone Tracey.

MAY & JUNE 2012

May and June 2012 also saw widespread floods throughout South Gippsland Shire. A number of roads were closed following large storms, causing significant traffic impacts in both instances. The high rainfall events were responsible for a number of landslips throughout the steeper regions of the municipality.

MAJOR WATER STORAGES

Name	Location	Authority Responsible	Dam Capacity @ FSL (ML)
Candowie Reservoir	Almurta	WPW	2263
Lance Creek Reservoir	Glen Alvie nr Kongwak Located just across the border in Bass Coast Council	SGW	4200
Reservoir 1	Ruby Creek nr Leongatha	SGW	19
Reservoir 2	Ruby Creek nr Leongatha	SGW	84
Reservoir 3 (Sir Herbert Hyland Dam)	Ruby Creek nr Leongatha	SGW	671
Reservoir 4	Ruby Creek nr Leongatha	SGW	1137
Reservoir 1	Coalition Creek nr Korumburra	SGW	222
Reservoir 2 (Ness Gully)	Coalition Creek nr Korumburra	SGW	74
Reservoir 3	Bellview Creek nr Korumburra	SGW	362
Little Bass Reservoir	Bass River nr Poowong	SGW	218
Battery Creek Storage	Batter Creek nr Fish Creek	SGW	123
Deep Creek Storage	Deep Creek (Foster)	SGW	19
Cooks Dam	Agnes River	SGW	59

SGW – South Gippsland Water

WPW – Westernport Water

Failure of any of the above dams or one of the many farm dams within South Gippsland may pose a threat to life and property depending on the mode of failure and the dam's proximity to downstream roads and buildings. In 2012 Foster was subject to sudden onset flooding due to an upstream dam break, causing evacuations and over floor flooding in the town.

FLOOD MITIGATION SYSTEMS

In addition to the levees listed below, there are also a number of associated floodgates and drains.

LEVEES

Levee banks protect much of the coastal regions from tidal inundation, and are intended to protect low-lying farmland. Associated with most of these levees are inland drainage networks and floodgates that allow the one-way transfer of run-off from land to sea. The most extensive of these is the sea wall that extends across the northern edge of Corner Inlet and has significant value to the community.

The extensive system of levees along the lower part of the Tarwin River and around parts of Andersons Inlet protect the townships of Tarwin Lower and the surrounding floodplains from nuisance flooding caused by small floods and the more frequent storm surges. The levees are overtopped by large floods and large storm surges.

There are also a number of other levees/seawalls at a number of other locations eg Black Swamp on the western side of Corner Inlet and private levees along the lower Powlett River.

Levee	Drain / Waterway	Operator
Tarwin Lower Levees	Tarwin River / Andersons Inlet	Private Landowners
Corner Inlet Sea Wall	Corner Inlet	Currently managed by a Section 86 Committee of Council
Black Swamp	Black Swamp	Incorporated Association

MAJOR ROAD CLOSURES

Road closures are a frequent occurrence throughout the municipality as a result of flash flooding and overflow from drains. With many roads alongside waterways and crossing rivers, a rise in water levels can quickly inundate roads – especially in the flat, low coastal regions.

Riverine Flooding	Flash Flooding
TARWIN RIVER South Gippsland Hwy - west of Meeniyah Strzelecki Hwy – Nth of Leongatha @ Berrys Ck Strzelecki Hwy – Allambie Sth to Leongatha Tarwin Lower Rd – Nth of Tarwin Lower across the floodplain Tarwin Lower Rd - west of Tarwin Lower to Venus Bay	South Gippsland Hwy – between Port Welshpool Rd and Slades Hill Rd in Welshpool
BASS RIVER Ferrers Rd - near Loch Loch-Poowong Rd - upstream of Loch Soldiers Rd - d/s from Little Bass Reservoir	
POWLETT RIVER Korumburra Sth Rd - near Outtrim	
AGNES RIVER South Gippsland Hwy – west of Toora	

RURAL ROAD CLOSURES

Tarwin River	
TARWIN RIVER WEST BRANCH Mardan Rd – east of Sth Gippsland Hwy Leongatha-Tarragon Rd –nth of Strzelecki Hwy (Wilkur Ck) Markley Rd – Watkins Ck (#46) Dyalls Lane – nth of Berry’s Creek Nerrena Rd – (Tarwin River West & Ruby Ck) Mossvale Park Rd – Berrys Creek Woreen-Mirboo Rd Carmody Rd – west of Timmins Estate Rd Beilbys Rd – east of Sth Gippsland Hwy Buckingham & Fowlers Rd – Sth of Old Koonwarra-Meeniyah Rd Old Koonwarra-Meeniyah Rd – nr South Gippsland Hwy Armstrongs Rd – nr Sth Gippsland Hwy	TOORA, FOSTER, WARATAH BAY Black Swamp Rd - Foster Hazel Park Rd - Toora / Welshpool Gale St – Waratah Bay, off Fish Creek-Waratah Rd Waratah Rd – between Foster-Waratah Rd and Sandy Point. Soldiers Rd (Foster Waratah Rd) - Yanakie Wilson Promontory Rd - @ Tidal River Wilson Promontory Rd – south of Yanakie Lower Franklin Rd – between Foster and Port Franklin, west of Port Franklin Rd Lewis St – Port Welshpool - drainage Turnbull St - @ Lewis St intersection – Port Welshpool - drainage
COALITION CREEK Bena Rd – Korumburra	
FISH CREEK Harding-Lawson Rd – Fish Creek	
TARWIN RIVER EAST BRANCH Turtons Ck Rd – Turtons Ck	
MAIN STREAM Bartons Rd – west of Wallers Rd Brown & Johnsons Rd – Tarwin Middle Stewart & Dunlop Rds – cnr Buffalo-Tullaree Rd, east of Tarwin Lower Inverloch-Venus Bay Rd – near Pound Creek Rd intersection	

GAUGE LOCATIONS

Gauge Name	Location	Gauge Zero m AHD	No.
TARWIN RIVER			
Wilkur Ck @ Leongatha	River		227227
Tarwin R East @ Mirboo	River		227228
Tarwin R East @ Dumbalk North	River		227226
Tarwin R @ Meeniyan	River		227202
Tarwin R @ d/s Fish Creek Drain	River		227253
East Tarwin (Mirboo Pastoral Co.)	Rainfall (11/71 – now)		85227
Ellinbank Dairy Research Institute	Rainfall (08/61 – 12/00)		85240
Olsens Bridge (Morwell R Prison)	Rainfall (08/77 – 08/91)		85106
Leongatha	Rainfall		
Mirboo North	Rainfall		
Fish Creek	Rainfall (1928-now)		85028
FRANKLIN RIVER			
Franklin R @ Toora	River		227237
AGNES RIVER			
Agnes R @ Toora	River		227211
BASS RIVER			
Bass R @ Loch	River		227219
TIDAL RIVER			
Tidal R @ Tidal River	River		227261

GAUGE LEVEL INFORMATION

Gauge Name	Event	Gauge Height (m)	Flow (ML/d)	ARI (1 in X years)
Agnes River @ Toora	1993 Sep	2.45		
	1995 Nov	2.40		
	1970 Mar	2.19		
	1995 Oct	1.97		
	2012 Jun	1.88		
	1998 Nov	1.86		
	2001 Apr	1.86		
	2011 Jul	1.82		
	1983 Mar	1.71		
	2005 Feb	1.70		
	2007 Nov	1.68		
	1978 Jun	1.60		
	1983 May	1.57		
	1980 Jun	1.53		
	1984 Jul	1.53		
	1970 Dec	1.52		
	1954 Nov	1.47		
2012 May	1.47			
2011 Mar	1.43			

Franklin River @ Toora	1995 Nov	3.82		
	2012 Jun	3.53		
	2011 Jul	3.23		
	1980 Jun	3.18		
	2001 Apr	3.15		
	1993 Sep	3.14		
	1984 Jul	3.12		
	2011 Mar	2.67		
	1983 May	2.62		
	1983 Mar	2.62		
	2007 Nov	2.35		
	2011 Apr	2.35		
	1984 Sep	2.26		
	1995 Oct	2.21		
	2008 Dec	2.15		
	1991 Jun	2.14		
Wilkur Creek @ Leongatha	2012 May	7.47		
	1988 Dec	7.46		
	1980 Jun	7.33		
	2012 Jun	6.80		
	1990 Oct	6.60		
	1989 Jun	6.24		
	1989 Oct	6.23		
	1996 Jul	6.21		
	1984 Sep	5.92		
	2011 Apr	5.85		
	2009 Oct	5.84		
	1985 Dec	5.56		
	1977 Jul	5.52		
	1993 Sep	5.47		
	1974 Jul	5.25		
	2005 Aug	5.24		
	2001 Aug	5.23		
	1983 Sep	5.14		
1991 Sep	5.14			
2011 Nov	5.13			
Tarwin River East @ Mirboo	1978 Jun	3.08		
	1980 Jun	2.54		
	1984 Jul	2.44		
	1971 Nov	1.96		
	1983 May	1.70		
	1974 Jul	1.68		
Tarwin River @ Meeniyah	2012 Jun	6.65		
	2011 Apr	6.63		
	1977 Jul	6.57		
	1956 Aug	6.54		
	1959 Sep	6.54		
	1960 May	6.50		
	1993 Sep	6.48		
	2001 Aug	6.43		
	1984 Jul	6.40		
	1970 Mar	6.38		
	1978 Jun	6.25		
	2012 May	6.21		
	1969 Jun	6.16		
	1964 Jul	6.12		
	1984 Sep	6.11		
	1990 Oct	6.10		
1956 Sep	6.09			
1995 Nov	6.08			

Powlett River @ d/s Foster Creek	1980 Jun	4.96		
	2012 Jun	4.88		
	1996 Jul	4.85		
	1990 Oct	4.67		
	1984 Sep	4.67		
	1984 Jul	4.41		
	2012 May	4.38		
	1989 Jul	4.36		
	1980 Jul	4.33		
	2001 Aug	4.27		
	1991 Sep	4.26		
	1993 Sep	4.17		
	1983 Sep	4.14		
	1986 Oct	4.13		
	2009 Oct	4.09		
	1983 Oct	4.08		
	2004 Sep	4.05		
	2011 Apr	4.02		
	1989 Jun	4.02		
	2011 Jun	4.00		

APPENDIX B. –FLOOD PEAK TRAVEL TIMES

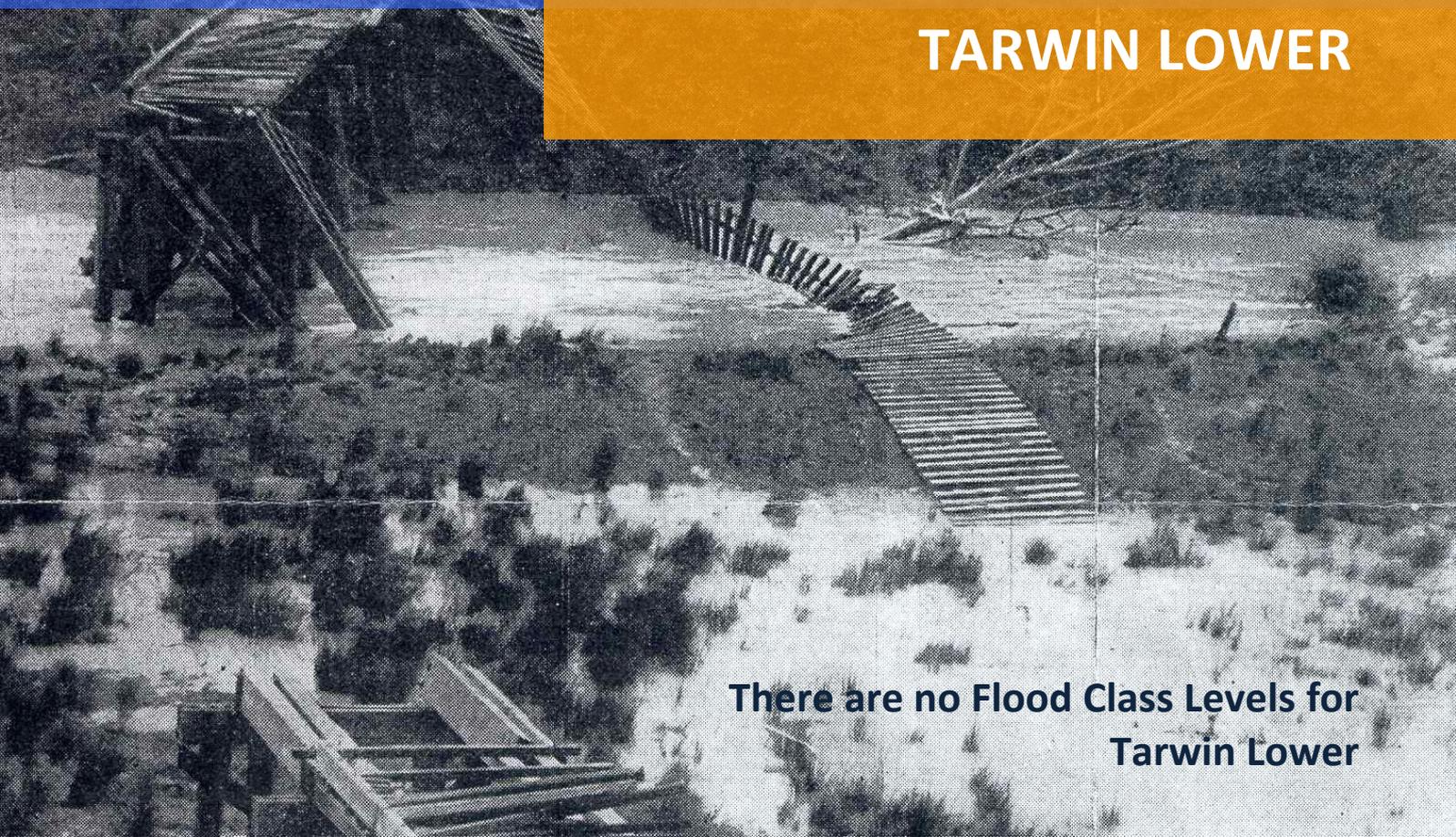
Travel times are calculated as the time the peak of the event takes to move from one gauge to the next. Note the onset of flooding can occur before the peak water level occurs.

It is possible for flooding to commence at downstream locations prior to peak heights being reached in the upper parts of the catchment due to both locally heavy rainfall and the backwater effects mentioned earlier due to tidal influences and storm surges.

Due to the high level of variability in antecedent catchment conditions, flood travel times can vary significantly, as demonstrated in previous floods. Nevertheless, as most of the rivers are relatively short, flood travel times tend to be shorter rather than longer – hours to a day or so.

Travel times listed here are **INDICATIVE ONLY** and are **HIGHLY VARIABLE**

Gauge Name	July 1984	June 1980	June 1978
Tarwin R @ Mirboo to Meeniyah	~44hrs	~36hrs	~11hrs



There are no Flood Class Levels for Tarwin Lower

LOCATION

The township of Tarwin Lower sits on the floodplain of the Tarwin River near its confluence with Anderson Inlet. The town has been subject to flooding on a number of occasions resulting in inundation, road closures and other flood risks to the community.

The township of Tarwin Lower is situated on the southern side of the river, approximately 2km upstream from its confluence with Anderson Inlets. The town is surrounded by large areas of coastal floodplain, with extensive levee systems. The **North Western Levee** is adjacent to Andersons Inlet.

FLOOD BEHAVIOUR

Tarwin Lower is subject to riverine flooding, overland flow flooding and coastal storm surge flooding. There is an extensive levee system described under 'Flood Mitigation Systems'.

RIVERINE FLOODING

The **northern floodplain** and areas upstream from Tarwin Lower are generally dominated by riverine flooding.

The movement of floodwaters from the floodplain to the inlet are significantly restricted by levees on the northern floodplain, especially the **North Western Levee**. Accordingly, flood waters tend to build up behind the levee causing water to spill over into other areas of the floodplain where levees / road crest levels are lower than 3.3m AHD.

Impacts from a 1% AEP event:-

- | Northern floodplain depths are generally greater than 1.0m.
- | Southern floodplain depths are generally much shallower but result in some overtopping of levees & roadways.

- | Tarwin Lower flood levels range between 2.9m AHD at the eastern (upstream) end and 2.7m AHD at the western (downstream) end.
- | Flooding at the western end of Tarwin Lower is caused by overtopping of a very low section of the Tarwin Lower Road (approx 1.8m AHD).
- | The levee / road between Tarwin Lower and Venus Bay on the southern side of the river is generally relatively low, typically 2.4m AHD.

COASTAL STORM SURGE FLOODING

The **southern floodplain** and areas downstream from the town are dominated by storm surge flooding.

Impacts during 100yr ARI storm surge conditions:

- | Tarwin Lower does not experience much flooding.
- | The North West Levee is not overtopped.
- | Southern floodplain is flooded from storm surges in excess of 2.4m overtopping of the Tarwin Lower Road to the west of the Riverview Hotel with impacts more extensive than under 1% AEP flood conditions.
- | Northern floodplain is flooded from the overtopping of levees upstream that have lower crest levels as the storm surge flows up the Tarwin River. Storm surge water then flows in a westerly direction through the northern floodplain before getting trapped behind the northwest level.

FLASH FLOODING/ OVERLAND FLOWS

Overland Flow flooding occurs within 30-36 hours of the start of heavy rain for big floods and up to 2-3 days for smaller floods.

FLOOD MITIGATION SYSTEMS

The extensive levee systems throughout the lower floodplain have been constructed over a long period and are designed to control nuisance flooding and storm surge inundation.

NORTH WESTERN LEVEE

The key control on flood behaviour within the Tarwin Lower Floodplain is the **North Western Levee** which has a crest level generally in excess of 3.3m AHD but a limited number of floodgates and / or culverts to provide floodplain drainage

TARWIN LOWER – VENUS BAY ROAD

The southern floodplain has a levee and/or road crest generally around 2.4m AHD. In essence, this levee extends all the way from the Tarwin Lower township through to the westernmost residential area of Venus Bay. The levee is noted in the Lower Tarwin Floodplain and Drainage Assets Study (WGCMA 2004) as being in fair to good condition.

FLOOD WARNINGS

There are no flood warning systems for this community.

ROAD CLOSURES

The following roads are subject to inundation and/or closure. Note that many minor roads may also be inundated.

- | School Road – Riverine
- | Tarwin Lower Road – Riverine, Storm Surge & Flash Flooding
- | Many local roads on the floodplain

COMMUNITY PROFILE

| The following is a demographic profile of Tarwin Lower (including Venus Bay) as at the 2011 census. Venus Bay is a holiday community where number swell significantly at holiday times.

Pop'n	Dwellings	Language	Needs Assistance	Age Profile
363			Living Alone 18%	<15 19%
			No Car 0%	55-74 32%
				15-54 42%
				>75 7%

GAUGE LEVEL INFORMATION

Flood Class	Flood Event	Meeniyan
	2012 Jun	6.65
	2011 Apr	6.63
	1977 Jul	6.57
	1956 Aug	6.54
	1959 Sep	6.54
	1960 May	6.50
	1993 Sep	6.48
	2001 Aug	6.43
	1984 Jul	6.40
	1970 Mar	6.38
	1978 Jun	6.25
	2012 May	6.21
	1969 Jun	6.16
	1964 Jul	6.12
	1984 Sep	6.11
	1990 Oct	6.10
	1956 Sep	6.09
	1995 Nov	6.08

DETAILED CONSEQUENCES & IMPACTS – FLOOD INTELLIGENCE CARD

Gauge	Location	Datum Type
Tarwin River @ Meeniyán	Station Number 227202	

Flooding Type	Consequences	Operational Considerations
Riverine Flooding 1% AEP	<p>SUMMARY</p> <ul style="list-style-type: none"> ▶ No buildings impacted but floor levels have not been surveyed ▶ Venus Bay isolated however access may be possible across private land. ▶ Sporting ground remains dry <hr/> <p>PROPERTIES</p> <ul style="list-style-type: none"> ▶ All properties to the west of School Road (10 in total and including the River View Hotel). ▶ Low lying agricultural land beside the river <p>ROADS</p> <ul style="list-style-type: none"> ▶ School Road is flooded to between 250mm and 500mm. ▶ Tarwin Lower Road to the west of the Riverview Hotel flooded to a depth of 1m. ▶ Tarwin Lower Road to the north east of the town, across the floodplain, near Inverloch-Venus Bay Rd intersection flooded up to a depth of 500mm. 	
Flash Flooding 1% AEP	<p>SUMMARY</p> <ul style="list-style-type: none"> ▶ Venus Bay is isolated however access may be possible across private land. <hr/> <p>PROPERTIES</p> <ul style="list-style-type: none"> ▶ Properties to the west of School Road are flooded. <p>ROADS</p> <ul style="list-style-type: none"> ▶ Tarwin Lower Road to the west of the Riverview Hotel and to the north of town (bigger events) are flooded. 	
Storm Surge 1% AEP	<p>SUMMARY</p> <ul style="list-style-type: none"> ▶ Venus Bay is isolated however access may be possible across private land. <hr/> <p>PROPERTIES</p> <ul style="list-style-type: none"> ▶ <p>ROADS</p> <ul style="list-style-type: none"> ▶ Most of the Tarwin Lower Rd from just west of the Riverview Hotel to Venus Bay is flooded to a depth of 250mm-500m.

APPENDIX D – EVACUATION ARRANGEMENTS

The Incident Controller may make the decision to evacuate an at-risk community. Evacuation is the responsibility of VICPOL and will be conducted as per the EMMV and the MEMP.

APPENDIX E - FLOOD WARNING SYSTEM

The Bureau of Meteorology does not provide a Flood Warning Service for any of the waterways or towns with the South Gippsland Shire

APPENDIX F – MAPS

- | South Gippsland Shire Elevation Map
- | Powlett & Bass River Catchment Flood Extent Map
- | Tarwin River Catchment Flood Extent Map
- | Tarwin Lower Flood Extent Map
- | Fish Creek Flood Extent Map

SOUTH GIPPSLAND SHIRE ELEVATION MAP



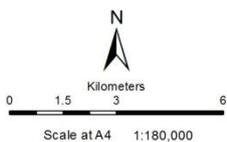
POWLETT AND BASS RIVER CATCHMENT FLOOD EXTENT MAP

Bass and Powlett River Catchment



TARWIN RIVER CATCHMENT FLOOD EXTENT MAP

Tarwin River Catchment



- ▲ River Gauge
- Rain Gauge
- Township
- Rail Line
- Major Road
- Secondary Road
- - - Extent of Flood Data
- River/Creek
- Coastline
- 1% AEP Flood
- South Gippsland Basin
- Lake/Swamp
- Ocean
- LGA Boundary



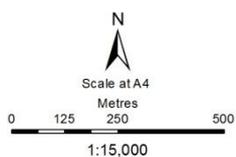
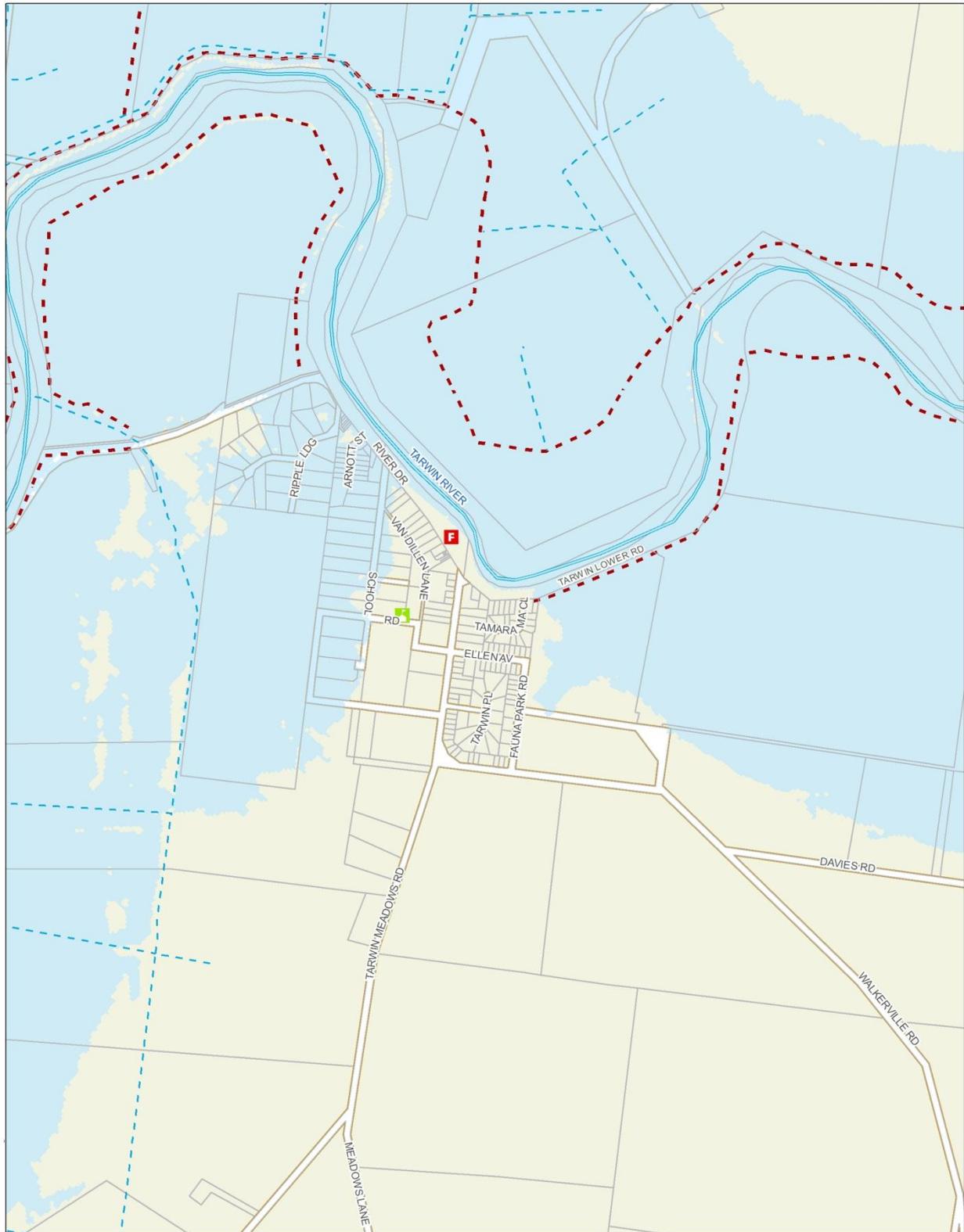
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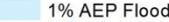


TARWIN LOWER FLOOD EXTENT MAP

SOUTH GIPPSLAND SHIRE COUNCIL

Tarwin Lower



-  School
-  Fire Station
-  Road
-  Levee
-  River/Creek
-  1% AEP Flood
-  Cadastre
-  Channel/Drain

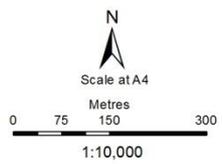
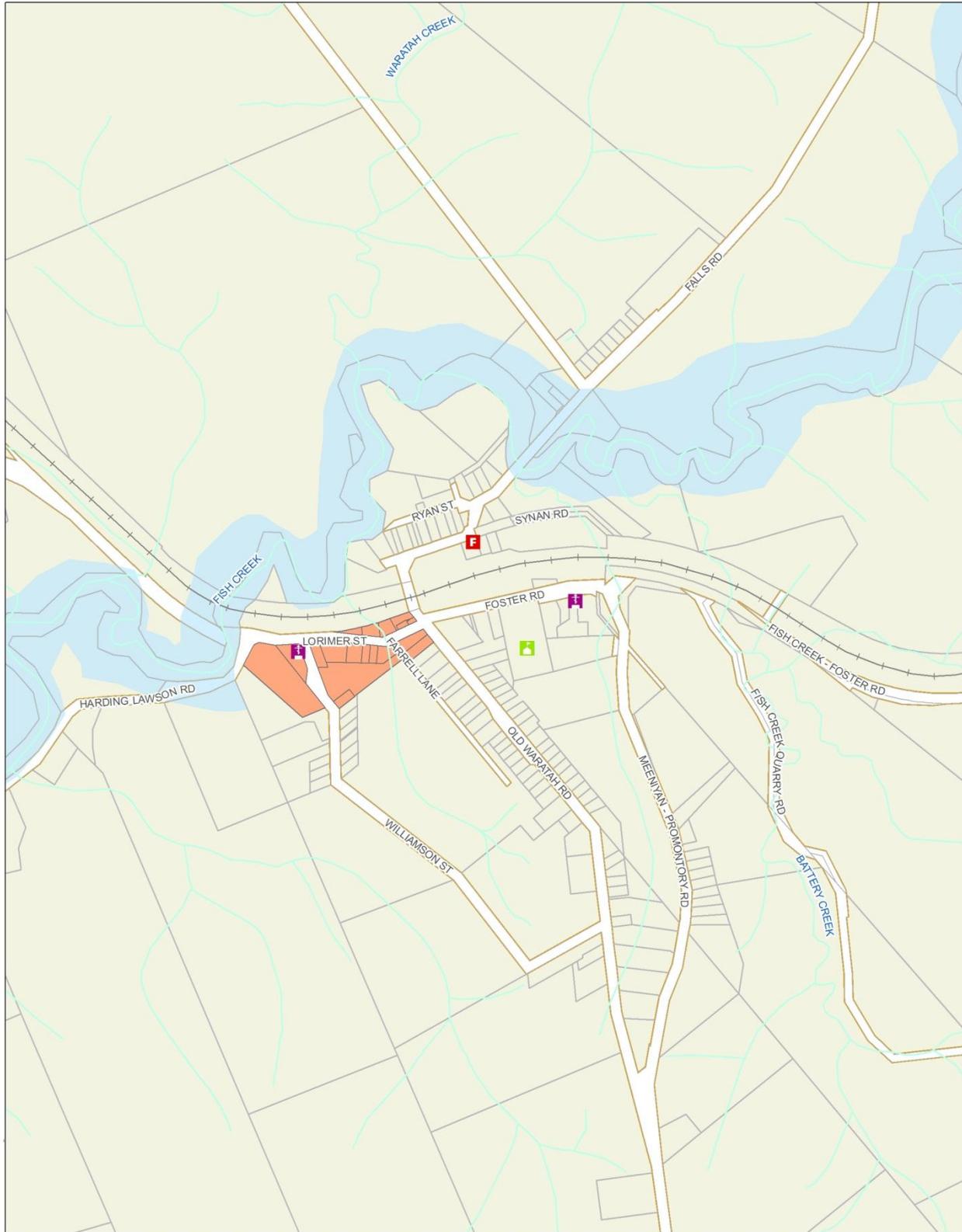


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FISH CREEK FLOOD EXTENT MAP

SOUTH GIPPSLAND SHIRE COUNCIL

Fish Creek



- F Fire Station
- S School
- C Church
- Rail Trail - Not in use
- Road
- Creek/Stream
- 1% AEP Flood
- Cadastre
- Flood Risk Area

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