CORANGAMITE CMA

Corangamite Regional Floodplain Management Strategy (2018-2028)

Mid-term Implementation Report: A Snapshot

May 2023

healthy and productive lands and waters cared for by thriving communities

CORANGAMITE CMA

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Photography credits: Native Hut Creek in flood provided by Water Technology, Geelong stormwater basin courtesy of City of Greater Geelong website, Batesford Local Flood Guide courtesy of SES website, Flood mapping around Charlesworth Street dam provided by City of Ballarat, all other images by Corangamite CMA.

Acknowledgement of Country

The Corangamite Catchment Management Authority works on the lands, waters and seas of the Wadawurrung People of the Kulin Nation, and the Kirrae Whurrong, Djagurd Woorroong, Gulidjan and Gadubanud People of the Maar Nation and acknowledge them as the Traditional Owners'. We pay our respects to their elders past present and emerging and acknowledge and recognise the primacy of Traditional Owners' obligations, rights and responsibilities to use and care for their traditional lands, water and sea.

Introduction

The Corangamite Regional Floodplain Management Strategy (CRFMS), 2018 – 2028, is a ten-year strategy developed in 2018 to determine how floodplains and flood risk in the Corangamite Catchment Management Authority (CMA) region can best be managed into the future.

The Strategy was developed in collaboration with partner agencies, including local government authorities, the Victorian State Emergency Service, coastal committees of management, Corangamite CMA, water authorities, and the Department of Transport and Planning.

The Strategy sets out how agencies with a flood management role will:

1. Work to understand, avoid and better manage flood risks.
2. Better understand and improve the environmental and cultural values of floodplains.
3. Support flood-emergency preparation and response across the region.

The Corangamite RFMS is five years into its implantation. The Mid-Term Implementation Report is required to review progress and update regional priority actions.

Regional Overview

Flood Risk

The Corangamite CMA region spans from the coastal town of Peterborough in the west to Ballarat in the north, Geelong and the Bellarine Peninsula in the east, and the Bass Strait coast to the south. The region includes the floodplains of the Barwon, Leigh, and Moorabool Rivers; Lake Corangamite; the Otway Coast region; and the Hovells Creek catchments, including the tributaries that drain to these major waterways.

There is a diversity of landscapes and development types within the region, all presenting their own unique flood management challenges. The Barwon River is the largest catchment in the region and the only catchment with a telemetered flood warning system. This system enables timely flood warning information for the townships of Winchelsea, Shelford, Inverleigh, Batesford, and the Geelong region.

Flash flooding is a challenge in several regions as there is little time to provide warnings or for emergency services to prepare. Areas impacted by flash flooding include coastal towns along the Otway coastline due to steep mountainous streams, Central Ballarat due to its historical piping and channeling of waterways, and parts of Geelong and Colac where drainage systems become overwhelmed after high-intensity rainfall events.

Whilst much of the region can be characterized as rural, there are several large regional towns and cities that are experiencing considerable development pressure. Much of the development increase is encroaching into the floodplain or has the potential to threaten sensitive floodplains further downstream, i.e., Ramsar listed wetlands and estuarine environments that provide unique habitat for a variety of fish and bird species.

One of the implications of growing towns is the increased risk of stormwater flooding. Local Government Authorities (LGAs) are accountable for managing urban stormwater in the Corangamite region and stormwater actions are not within the scope of the Strategy. However, stormwater and riverine flood risks are often interrelated and must be considered as part of a 'whole of catchment' approach to floodplain management.

The main areas of riverine flooding concern include Geelong, Ballarat, Lara, Colac, Birregurra, Inverleigh and Teesdale. All these areas are experiencing increases in development growth. Figure 1 highlights the Corangamite CMA region and the priority flood risk areas.

The region includes 175 kilometres of coastline with development pressure being seen in many coastal towns. The risk of coastal inundation is expected to increase for many coastal areas in the future due to climate change induced sea level rise. Two significant Coastal Hazard Assessment (CHA) Projects have been undertaken in the region. The Bellarine Peninsula and Corio Bay CHA highlighted the challenges facing the Bellarine Peninsula coastline, especially where there is development pressure.

There are also low-lying sections of the Great Ocean Road that are at risk from the impacts of coastal storm events. For example, risks relate to the potential coastal inundation of the Great Ocean Road at Princetown which could occur in combination with riverine flooding from the Gellibrand River. With future sea level rise, such events are expected to worsen. Towns along the Great Ocean Road are potentially at risk of being isolated because of coastal inundation or storm surge events. These towns also experience large influxes of tourists over the summer months and school holidays, exacerbating the vulnerability of these areas.

Understanding the flood risk in many of our rural areas with small populations is challenging as the cost of flood modelling is often cost prohibitive, particularly for smaller councils. Agencies are often left to rely on anecdotal flood information to inform emergency management and road closures.

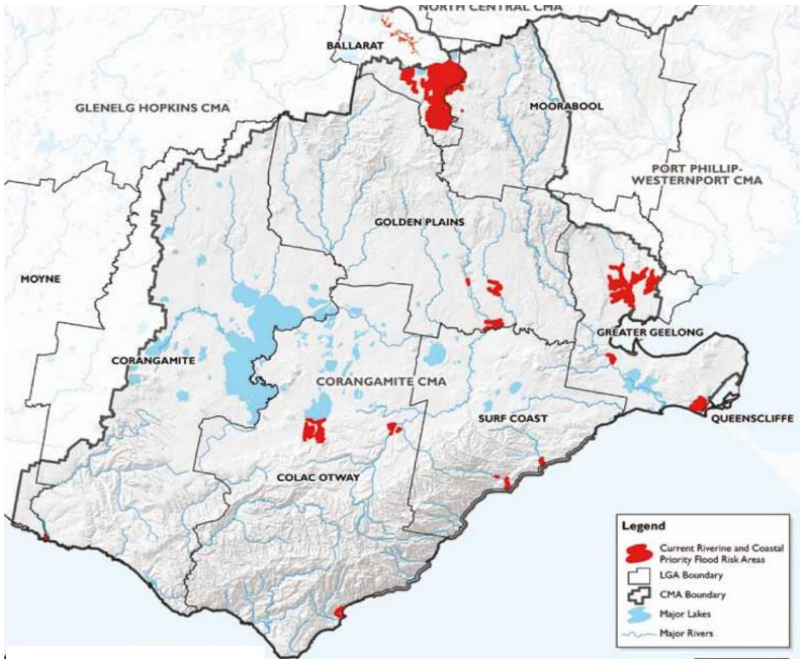

Figure 1 Priority flood risk areas identified in the CRFMS.

Opportunities

According to *Victoria's Regional Centres – A Generation of Change Report (Department of Planning and Community Development, 2010),* population growth in regional Victoria provides a number of opportunities for the regions, such as increasingly well-qualified work forces required by modern businesses, improved transport and communications infrastructure and increased economies and advantages of scale. Where development pressure and infrastructure works impact the floodplain, relevant agencies, LGAs, communities and developers have developed successful working relationships to resolve issues and find innovative solutions to ensure floodplains are protected and communities are not adversely affected by increased flood risk. A good example is the Sparrovale Wetlands Precinct which the City of Greater Geelong are developing to protect the Barwon River floodplain and Lake Connewarre Ramsar complex from the impacts of increased stormwater flows.

The region boasts a broad range of bioregions and significant flora and fauna, including wetlands of international significance under the Ramsar Convention as well as a number of intermittent estuaries that provide unique habitat for a variety of fish and bird species. Whilst flooding can severely disrupt communities and regional economies, at the same time, flooding has a range of benefits to these environmentally and culturally significant landscapes. Whilst protecting such areas from the impacts of development is a challenge, development can also provide an opportunity to protect and improve these important landscapes. It especially provides an opportunity for communities to connect with and value their local waterways (e.g. Sparrovale wetlands, Moorabool River, Barwon River through Fyansford and Geelong).

Technological advances have enabled improved flood modelling which now provides agencies with a range of flood products to better inform town planning, emergency management and community resilience as well as better-informed assessment of appropriate and cost-effective flood mitigation measures. Web-based platforms such as *Flood Zoom* enable sharing of flood information between agencies to further improve cooperation and effective flood management.

The current approach to flood studies provides the opportunity for communities to share their local flood knowledge, have their issues addressed and to be a part of the process for future flood management in their area.

Waterways and floodplains are important cultural heritage places. Many Aboriginal cultural sites – such as middens, initiation grounds, tools, fish traps and scar trees – are on or near waterways and floodplains. Flood studies provide an important opportunity to engage with Traditional Owner groups to enable assessment of cultural heritage sites (known and potential) and to address issues of protection of sites in the event of a flood, mitigation works and post-flood recovery works.

Changes in the Last Five Years

Significant changes in the region in the last five years have been on the back of development associated with urban sprawl. The Corangamite RFMS noted that five main areas in the region were developing Precinct Structure Plans and Urban Growth Plans. Those areas were:

1. Geelong (Northern and Western Geelong Growth Areas (NWGGA))
2. Armstrong Creek
3. Lara (West and North)
4. Fyansford (Moorabool River)
5. Ballarat West.

As predicted, urban development in these areas has continued, with significant floodplain and stormwater planning remaining a priority. Although stormwater management is not within the scope of this strategy, it does continue to present challenges in relation to flood management, especially to ensure downstream communities and sensitive natural environments (such as wetlands and estuaries) are protected from potential adverse flooding and water quality impacts.

The region has also seen increased development in several regional towns and coastal areas. Coastal communities are developing an increased awareness of the coastal hazard associated with climate change. Many of our coastal agencies are preparing to carry out Coastal Hazard Assessments and Adaptation Plans to address the increased flood and erosion risk associated with the impacts of climate change.

Strategy Implementation

Implementation Committee

Under the *Water Act 1989*, the Corangamite CMA is the floodplain management authority for the Corangamite Water Management District, and thus leads the implementation of the strategy. As such, the CMA coordinates the development and application of the Implementation Plan (including reporting to the Department of Energy, Environment and Climate Action (DEECA)) and facilitates Implementation Committee meetings to ensure the strategy delivers on its intended outcomes.

Responsibility for implementation of the Strategy is shared by the delivery partners, particularly the LGAs, the Corangamite CMA and the Victorian State Emergency Service (VICSES). Accountability for the implementation of specific actions from the Strategy rests with the agency nominated to lead the delivery of each action. Currently, there are 19 agencies with lead actions in the strategy.

Contributing partners make up the Implementation Committee (IC), and includes Corangamite Shire, Borough of Queenscliffe, City of Greater Geelong, City of Ballarat, Colac Otway Shire, Surf Coast Shire, Moyne Shire, VICSES, CCMA, Department of Transport and Planning, Coastal Committees of Management (Great Ocean Road and Parks Authority (GORCAPA), Bellarine Bayside, and Barwon Coast), Moorabool Shire, and Golden Plains Shire.

The Implementation Committee meets 1-2 times a year to discuss and develop the following:

- Development and review of the Monitoring, Evaluation and Reporting Plan
- Development and review of the Strategy Implementation Plan.
- Discussion of issues relevant to the implementation of strategy actions.
- Share information regarding funding opportunities.
- Sharing other relevant information that may be of use to IC members.

Reporting Structure

Regular reporting is an important tool to ensure accountability for the investment of government and other funds into activities that deliver on Strategy outcomes.

Sharing outcomes and progress on priority action delivery with the Corangamite community and stakeholders provides the opportunity to further build awareness, connection and understanding of managing and living on floodplains.

In addition, regular reporting and periodic evaluation provides opportunities for managers and collaborative partners who are involved in the delivery of the Strategy to track their progress and to identify opportunities for adaptive management if required.
As part of the reporting process, there is:

- An internal assessment by Corangamite RFMS Implementation Committee members at annual implementation plan and Monitoring, Evaluation and Reporting (MER) review workshops and after significant flood events.
- An annual report to DEECA and Implementation Committee
- Post-flood event reporting to the Minister, DEECA, Implementation Committee and flood-affected communities.
- Corangamite RFMS mid-term and end-of-term review to DEECA and Implementation Committee (every five years).

Achievements So Far

Good progress is being made with the implementation of the Corangamite RFMS. When it was originally developed, 108 actions were identified to address flood risk in the Corangamite CMA region. In the last 5 years another 17 actions have been added to the strategy, bringing the total number of actions up to 125. Of the 125 actions identified, 41.6% are complete, 29.6% are funded and in progress, leaving 28.8% not yet started or no longer a priority.

The last five years of strategy implementation has seen improved collaboration between the Corangamite CMA, LGAs, VICSES, Traditional Owner Groups, Coastal Committees of Management, Water Authorities, and the Department of Transport and Planning with regards to flood management. There has been improvement in the sharing of flood information, understanding of roles and responsibilities and collaboration on major development projects.

An added benefit of improved collaboration and understanding of roles and responsibilities has seen an improved understanding and collaboration at the start of planning for new urban growth zones. This is evidenced with the City of Greater Geelong's identification and filling in of flood data gaps in areas expected to undergo population growth. Having that information and an understanding of the Corangamite CMA development requirements gives certainty to developers and planners and provides a more efficient planning process.

There has been considerable improvement in flood knowledge, especially where the flood hazard coincides with development pressure. As well as the number of flood studies undertaken, there has also been technological advances in flood modelling, providing communities and agencies with an increased amount of flood information and information products to enable improved community awareness, individual property assessments, emergency response and town planning. The areas which have seen improved flood knowledge over the last five years include Geelong, Batesford, Clifton Springs and Drysdale, Lara, Inverleigh, Birregurra, Teesdale, Ballarat, Skenes Creek and Kennett River.

Local Flood Studies

Most, if not all, of the actions in the strategy require an understanding of the flood hazard and subsequent risk. Flood studies provide an important understanding of the flood hazard to enable required actions to be identified.

The key tasks of a detailed flood study include improving local flood knowledge, examining whether existing planning schemes, flood mitigation infrastructure, municipal flood emergency plans and total flood warning systems match local flood risks. LGAs have accountability for implementation and maintenance of these measures. In the past five years, 13 flood studies (including flood mapping assessments) have been completed and another 6 are currently underway or have seed-funding. The following case studies provide examples of some of the completed flood studies in the region.

Case Study: Teesdale Flood Study

(Action 20: Undertake a detailed flood study for Teesdale. Follow up with a Planning Scheme Amendment.)

Current status: underway
Strategy Objectives met #1. Assess flood risk and share information.
#4 Avoid future flood risks.
#7. Protect and restore the cultural values of floodplains

Teesdale is a regional town situated in Golden Plains Shire. Native Hut Creek and its associated floodplain flows through the town. The township has seen an increase in population growth in recent years with potential for further growth being identified in the vicinity of the creek and its tributaries.

The existing flood planning overlays for the township were based on 2016 regional flood mapping. However, there was evidence to suggest discrepancies in the data, leading to a loss of confidence in the accuracy of the existing flood mapping and planning overlays. The new flood study and subsequent planning scheme amendment will provide confidence in the data and help to ensure that future development is appropriate to the flood risk as well as informing flood emergency management actions.

Native Hut Creek in flood, Teesdale, 1949 (Photo credit: Water Technology)

Figure 2 Case Study – Teesdale flood study

Case Study: Birregurra Flood Study

(Action 28: Seek funding support to undertake a flood study for Birregurra).

Current status Complete
Strategy Objectives met: #1. Assess flood risk and share information.
#4 Avoid future flood risks.

Birregurra is a popular regional town situated in Colac Otway Shire and is another example of a town experiencing increased development pressure. The 2016 flood event caused significant flooding in the town and demonstrated the inaccuracy of the existing flood overlays which were based off poor quality information. It was recognized that a flood study was needed as a matter of urgency to ensure future development in the town was appropriate to the flood risk.

The flood study was greatly aided by input from the community, who were able to provide detailed local flood knowledge. Regular community meetings kept the residents updated and involved with the process and provided an opportunity for them to query flood study results. The flood study was completed in September 2021 and the planning scheme amendment implemented in September 2022.

2016 flood event – Anderson Street, Birregurra (Photo credit: Corangamite CMA)

Figure 3 Case Study – Birregurra flood study

Case Study: City of Greater Geelong – Identify and Address Existing Flood Data Gaps

(Action #39 Identify and address existing flood data gaps and future data needs in relation to flood risk in and around land development and where riverine and stormwater are identified as a joint risk. E.g., Drysdale, Clifton Springs, Leopold, Armstrong Creek, Ocean Grove, Waurn Ponds and Cowies Creek areas.)

Current status: Complete
Strategy Objectives met: #1 Assess flood risk and share information,
#4 Avoid Future Flood Risks,
#6 Protect and Restore Floodplains for their Ecological Values.

The City of Greater Geelong and Corangamite CMA successfully identified and addressed flood data gaps and future data needs in relation to flood risk in and around land development and where riverine and storm water are identified as a joint risk. This project was considered a high priority given the significant development pressure in the Geelong region. Identifying data gaps and future data needs is important to enable appropriate town and infrastructure planning to ensure appropriate future development.

This project achieved several Corangamite RFMS objectives, including 'protect and restore floodplains for their ecological values' where environmental assessments were incorporated in the project. This strategy has established a shared pathway toward improved understanding of flood risks as well as ecological values and threats in order to better focus investment in investigation, engagement, development controls and physical work.

Managing stormwater to reduce the flood risk and protect downstream environments (Photo credit: City of Greater Geelong, geelongaustralia.com.au/stormwater)

Figure 4 Case Study – Identify and Address Existing Flood Data Gaps

Building a Flood Resilient Community

VICSES in partnership with LGAs and the Corangamite CMA have developed a range of education products to improve community knowledge of the flood risk in their locality to help build a flood-resilient community. Education products have included flood education videos, local flood guides, property food guides, community response plans and the installation of community education signs and gauge boards at high priority locations. Products have been, or are currently being developed for Ballarat, Geelong, Lara, Batesford, and Peterborough. The following case studies provide examples of projects that support communities to become flood resilient.

Case Study: Batesford Local Flood Guide

Action #34 (Undertake community flood education activities and develop flood awareness products for Geelong)

Current status: Complete
Strategy Objectives met: #2 Build a flood resilient community

Batesford was identified as a town with a significant flood risk because of flooding from the Moorabool River. It has been impacted by several flood events in recent times, including a major flood event in November 1995. The recent *Lower Moorabool and Lower Barwon Flood Study, 2019*, provided an assessment of the flood risk for a range of flood events.

Following on from the flood study, VICSES, in partnership with the Corangamite CMA, City of Greater Geelong and Golden Plains Shire, produced the Batesford Local Flood Guide in September 2021.

The Flood Guide provides local residents with up-to-date information about the flood risk in the township, river gauge heights and associated flood impacts, how to stay informed about flood warnings as well as emergency check lists. The information is clear, concise, and easy to follow. Local Flood Guides empower the community to be flood prepared, which places less burden on emergency response resources.

VICSES has secured grant funding to modernise and optimise the existing Local Flood Guides as a community engagement tool. Through extensive community consultation, a new template will be developed, using accessible mediums, language, and relevant information. This will include local flood risks, preparedness activities, and flood response guidance, ensuring easy comprehension
for all.

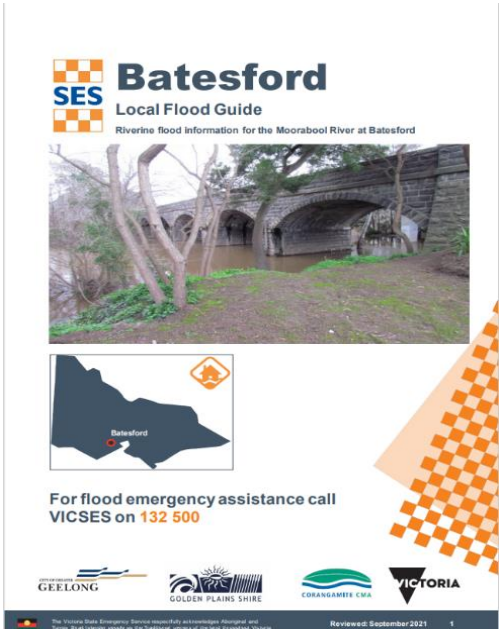

Photo credit: www.ses.vic.gov.au/Batesford Local Flood Guide

Figure 5 Case Study – Batesford Local Flood Guide

Case Study: Providing Flood Information to the Community via a Flood Portal

(Action #48 Update the Corangamite CMA flood portal to include more information.)

Current Status: Ongoing but currently up to date.
Strategy Objectives met: #1 Assess flood risk and share information.
#2 Build a flood resilient community.

The Corangamite CMA created the Flood Portal (accessible via the CCMA website) to provide a free online flood information resource for the community. The flood portal provides instant information on the 1% AEP flood extent for riverine and coastal flooding across the region. The Flood Portal is an ideal resource for property owners, developers and prospective property buyers to determine if the property is likely to be impacted by flooding and whether they need to seek further information on planning requirements for potential developments. The CMA has recently finished updating the Flood Portal to include all recent flood studies, ensuring customers have access to the most up to date flood information.

Benefits of the portal include providing instant advice for property owners and reducing the number of flood information requests to the CMA. There were 321 flood portal visits in the past 12 months.

Corangamite CMA Flood Portal (photo credit: CCMA Flood Portal, ccmaknowledgebase.vic.gov.au)

Figure 6 Case Study – Providing flood information to the community via a Flood Portal

Flood Mitigation

Flood mitigation works are structural measures used to mitigate the effects of flooding and can include measures such as levees, floodways, and retention basins.

Whilst the most cost-effective flood mitigation measures are preventative measures, there are ongoing legacy issues in many towns. This is especially evident in Ballarat, a historical town with several legacy issues, including channelising and piping of waterways, and loss of the natural function of their floodplains, which increase the risk of flash flooding through the township. There are also issues where inappropriate historical development increase the flood risk.

The following case study provides an example of a flood mitigation project in the region.

Case Study: Charlesworth Street Dam Wall

(Action 44). Investigate options to address the risks around the earthen embankment along Charlesworth Street.

Current Status: Underway
Strategy Objectives met: #3 Reduce existing flood risks.

The principal objective of the project is to deliver a compliant dam embankment through the reconstruction of Charlesworth Street and reduce the dam safety risks according to ANCOLD Guidelines.

Given the nature of flooding and the significantly deep flood waters being held up against the existing embankment, there poses a residual risk should the embankment fail. Recent construction of a retirement village on the downstream side of the embankment has also limited the potential to develop a suitable spillway structure to reduce the likelihood of embankment failure. Flood modelling of an appropriate dam breach found that the number of properties along Specimen Vale Creek impacted by a 1% AEP flood was found to increase from 96 up to 174 while the properties flooded above floor increased from 28 to 108.

In 2019, City of Ballarat (CoB) engaged Entura who presented six design options for the Charlesworth Street Dam Wall. The CoB selected Option 4, which is construction of new embankment with partial removal of the sound barrier at the spillway location. In 2021, the CoB had engaged St. Quentin Consulting who had developed the preliminary plans for the construction of Charlesworth Street Dam Wall. The project is currently in the initiation stage and the next step is to issue a Request for Tender. Anticipated construction completion of the project is Quarter 1, 2025. The current total project budget is $2.5M.

1% AEP flood mapping around Charlesworth Street Dam wall (Photo credit: City of Ballarat)

Figure 7 Case Study - Flood mapping around Charlesworth Street Dam Wall

Managing Future Flood Risks Associated with Climate Change

Victorian Planning Policy requires planning authorities to plan for and manage the coastal impacts associated with climate change. All coastal councils are required to currently plan for a 0.8 metre sea level rise by the year 2100 (relative to 1990 levels). The following case study is an example of how future climate change is being planned for in the region.

Case Study: Implementing New Planning Controls to Address the Impacts of Climate Change

(Action # 38. Investigate the most appropriate planning process to ensure flood study outputs from the *'Our Coast'* program is incorporated into the Planning Scheme.)

Current Status: Complete
Strategy Objectives met: #4 Avoid future flood risks

The City of Greater Geelong responded to the climate change impact challenge by implementing the findings of the *Bellarine Peninsula - Corio Bay Local Coastal Hazard Assessment December 2015 (LCHA).* In 2020, the City of Greater Geelong introduced a new Land Subject to Inundation Overlay Schedule 2 (LSIO2) to be applied to properties identified as being subject to future combined impacts of a 0.8 metre sea level rise and a 1% AEP storm surge event.

The LSIO2 applies to 1,614 coastal properties on the Bellarine Peninsula and Corio Bay at Avalon, Lara, Corio, Geelong, East Geelong, Newcomb, Moolap, Leopold, Bellarine, Portarlington, Indented Head, St Leonards, Swan Bay, Ocean Grove, Wallington, Barwon Heads, Connewarre and Breamlea.

In consultation with the City of Greater Geelong, the Corangamite Catchment Management Authority (as the referral authority for planning applications impacted by coastal flooding) developed an assessment method that distinguished between intensification development which would be assessed against the expected 2100 sea level rise, and single dwelling replacement which would be assessed against an expected 2070 sea level rise (based on research documented in the Victorian Climate Science Report 2019.) 2070 was chosen based on the generally accepted lifespan of a new building to be 50 years.

Coastal areas around the City of Greater Geelong and Bellarine Peninsula showing modelled flood extents for the 1% AEP event + 0.8m sea level rise (Photo credit: Corangamite CMA GIS flood mapping)

Figure 8 Case Study – Implementing planning controls to address impacts of climate change

Lessons to be Learnt

The Corangamite RFMS is at the half-way point of implementation with another five years left to deliver on the remaining actions. The following is a table of questions that the Implementation Committee considered to help guide the direction of the second half of Strategy delivery.

Table 1 Questions to Inform Second Half of Strategy Delivery

Questions to Inform Second Half of Strategy Delivery	
Question	**Comments**
What has worked well so far?	• Almost all of the Strategy partners have been actively involved in delivery of the strategy and take the minimising of flood risk in their region seriously. • The Implementation Committee meetings provide an opportunity for agencies to share knowledge and issues and develop positive partnerships. • Up to date flood studies are really beneficial to talk to the community about. Shows the community that we have good information to talk about which gives community more confidence.
What hasn't worked so well?	• Some Councils in the CCMA region have their flood 'hotspots' in other CMA regions. Therefore, CCMA projects are low priority. • The Strategy's priority rating doesn't seem to reflect when projects get done. E.g. of the projects yet to begin, 9 are low priority, 18 are medium priority and 11 are high priority. • It has been difficult getting a few of our partners involved. E.g., finding out who the representative is has been a challenge in some instances. • Councils have challenges funding high cost flood mitigation works with the result that actions to avoid future flooding in some areas may not be addressed in the short-medium term. (this was an issue raised by a number of councils both big and small) • The description of the actions in the strategy is inadequate. More detail and rationale is required considering staff turnover. New staff aren't always aware what that action is referring to. • Some actions require a longer time frame. • Who should be the representative from an organisation? E.g., LGAs have a number of roles in floodplain management such as planning, infrastructure, emergency response. • A number of LGA's experience difficulty at councillor level getting flood mapping into the planning scheme. Needs to be addressed through educational process and/or a different approach to implementing flood mapping into the planning scheme.

Questions to Inform Second Half of Strategy Delivery	
Question	**Comments**
Are there any unexpected outcomes or things outside of your control that had a positive or negative impact?	• Projects which focus on floodplain ecological / environmental outcomes are difficult to fund (i.e. Risk Resilience Grants Scheme (RRGS) is focussed on risk to life). • Smaller Councils struggle to find their one-third commitment for funding applications. Despite in-kind contributions being acceptable, project management capability is still a difficulty. • Agency staff turnover occurs on a regular basis. New IC members have to familiarise themselves with the actions and whether they are being addressed. • Due to timeframe from start of RFMS, LGA councillors have moved on, and new views/positions on issues has also changed. • Economic impacts of PSA's changes to proposed built form. Councillors are less likely to approve PSA's because of this. • Despite best available science, some communities just don't' want change.
Would you approach the implementation of the Corangamite RFMS any differently in the second half of its implementation and why?	• Look to re-engage Traditional Owners in IC meetings
Do you want to share any lessons that may benefit other delivery partners?	• Including a peer review component in the flood study process is valuable as it gives assurance that the Study has been undertaken thoroughly.

Changes to Priority Actions

The Corangamite RFMS has a total of **125** Actions, **17** of which have been introduced since 2018. This is a considerable number of new actions, especially given there are no minimum requirements for Partners of the RFMS to introduce actions and given the difficulties COVID has presented in the completion of field work and/or funding. This demonstrates that partner agencies are actively involved in ensuring the Corangamite RFMS is delivered, and that flood risk is minimised in their regions.

Since the Corangamite RFMS was written, the Great Ocean Road Coast and Parks Authority (GORCAPA) has been formed and is responsible for managing a large section of the Corangamite CMA region's southern coastline, and parks of Victoria's Great Ocean Road. Since becoming a partner agency of the Corangamite RFMS, GORCAPA have identified 10 new actions relating to coastal flood hazard and riverine flood impacts on GORCAPA managed land.

Other new actions have come out of previous actions. E.g., the action to *Re-run the 'Our Coast' model to include 2070 1% AEP flood levels,* came out of the City of Greater Geelong's implementation of the Land Subject to Inundation Overlay – Schedule 2 (LSIO2) planning controls along their coastal areas (refer to Figure 8 case study). The results of Colac Otway Shire's action 80

Seek funding to review the priority retarding basins in Colac has led to a new action to design and construct flood mitigation works.

New Actions Identified

Table 2 New Strategy actions identified since the development of the Corangamite RFMS

Action	Lead Agency	Reason for new action	Are there resources available to implement them?	Is the lead agency willing to invest in these priorities?
Re-run the 'Our Coast' model to include 2070 levels (40cm sea level rise)	CCMA	Identified as part of the LSIO2 process. The new mapping is required to enable CCMA assessment of developments in the LSIO2.	Yes – the project has been completed	Yes
Undertake a flood risk management study of the Upper Barwon River to better inform flooding of the upper catchment, impact to roads and to complete the flood model of the catchment.	CCMA	Flooding of the Upper Barwon over the past 3 years has highlighted the flood risk in this area and the impact to major roads. More detailed flood information is needed to address the problem.	Yes, however funding will be required.	Yes
Following Birregurra flood study, design and construct flood mitigation works	Colac Otway Shire	Flood mitigation options to reduce the flood risk were identified in the Birregurra Flood Study.	No	To be considered (TBC) -Beyond current capacity of Council to fund given cost and other Council priorities.
Colac retarding basins - Following review of the priority retarding basins in Colac, design and construct flood mitigation works	Colac Otway Shire	Identified as an outcome of action 80 to review the Colac retarding basins.	Partly	Yes
Due to the completion of the Kennett River and Skenes Creek Concept Stormwater Management Plans, the Planning Scheme should be amended and updated with the new flood maps and requirements.	Colac Otway Shire	This has been identified in the 2023 Planning Scheme Review and Council will amend its planning scheme in the next few years to update the mapping	Yes	TBC

Action	Lead Agency	Reason for new action	Are there resources available to implement them?	Is the lead agency willing to invest in these priorities?
Bellarine Bayside CoM will develop local climate change adaptation planning in relation to inundation and coastal processes	Bellarine Bayside COM	Coastal Hazard Assessments along this coastline have identified several assets at risk from the impacts of climate change.	Yes	Yes
GORCAPA will update GORCAPA Emergency Management Plan (includes flood considerations) to include newly acquired caravan parks	GORCAPA	GORCAPA is a new organisation formed after the development of the CRFMS and has only recently assessed its actions.	Yes (project complete)	Yes, Emergency Management Plans have been developed for newly acquired parks.
GORCAPA will develop a climate change policy and strategy	GORCAPA	See above	Un-funded at this stage	Yes -actions pertaining to this will be captured in Authorities new 5-year business strategy
GORCAPA will investigate Wye River inundation and erosion mitigation planning	GORCAPA	See above	Yes – initial project completed	Yes
GORCAPA will investigate Kennett River flooding and stormwater issues.	GORCAPA	See above		Yes
GORCAPA will investigate Skenes Creek inundation and erosion mitigation options	GORCAPA	See above		Yes
GORCAPA will undertake a scoping study – from Point Impossible to Warrnambool Coastal Hazard Resilience and Adaptation Plan	GORCAPA	See above	Yes	
GORCAPA will implement the Anglesea Coastal Hazard Resilience and Adaptation Plan	GORCAPA	See above	Yes	
GORCAPA will lead the North Lorne Coastal Hazard Investigation	GORCAPA	See above	Yes – this project is nearing completion	
GORCAPA investigate options for Cosy Corner Seawall Upgrades	GORCAPA	See above	Yes – interim protection complete.	Yes for design, funding will be sought for construction

Action	Lead Agency	Reason for new action	Are there resources available to implement them?	Is the lead agency willing to invest in these priorities?
GORCAPA is to lead the Point Impossible to Warrnambool Coastal Hazard Assessment	GORCAPA	See above	Yes – project complete	
Investigate flood mitigation design options for Inverleigh (following on from recommendations from Inverleigh Flood Study)	Golden Plains Shire	Recommended action from the Inverleigh Flood Study Mitigation Options Report to reduce the flood risk in Inverleigh	Yes, funding has been provided	Yes

Changes to Action Priorities

The Corangamite CMA has recorded 3 changes to Priority Actions since the Corangamite RFMS inception in 2018, as of April 2023. These changes are outlined in the table below (Table 3).

Table 3 Changes to Strategy action priorities since the development of the Corangamite RFMS

Lead agency	Action	Priority Change (2018 - 2022)	Reason for Priority change
City of Ballarat	Action 44 - Investigate options to improve augmentation of Yarrowee upstream of CBD.	High -> Low	This priority was changed from High to Low, given new flood modelling showed a slight reduction in the flood extents around the Central Business District (CBD). Drainage upgrades are also expected to reduce flood extents for Curtis Street and Bridge Mall.
City of Ballarat	Action 87: Update flood study for Buninyong (Union Jack Creek catchment).	Medium -> Low	Priority has been downgraded due to minor flood extents compared to other catchments and low development activities in that area.
City of Ballarat	Action 43: Investigate options to improve management of Gnarr Ck through the CBD with a particular focus on including any upgrades in partnership with planned VicRoads upgrades for Mair Street.	High -> Low	Priority has been downgraded due to new flood modelling showing reduced impact.
City of Ballarat	Action 91: Investigate the viability of a flood warning system for the city, e.g. methods to turn flood study outputs into tools to assist with flood warning, preparedness and response.	Medium -> Low	No further investigations undertaken. Waiting on further funding.

Lead agency	Action	Priority Change (2018 - 2022)	Reason for Priority change
Colac Otway Shire	Action 80 - Seek funding to review the priority retarding basins in Colac,	Medium -> High	Item 80 moved to a high priority as grant funding was successful and Council has to commence work on this in 2022-23.
Golden Plains Shire	Action 20 – Undertake a detailed flood study for Teesdale **(Original wording: Undertake a desktop review of the Regional Floodplain Mapping Project in comparison with current planning flood overlays to determine if an upgrade to the planning scheme is required, particularly for areas where there is development pressure.)**	Medium -> High	The CCMA conducted work in Teesdale in the early stages of the RFMS, and identified that the existing mapping was probably inaccurate, this is the reason the priority was increased from 'Medium' to 'High'. As such, Golden Plains Shire Council have commenced the Teesdale Flood Study, which is nearing completion.

Process Followed to Review and Update Regional Priorities

The Corangamite CMA facilitate Implementation Committee meetings twice a year with agency partners to review and update the Regional Priorities Work Plan.

Prior to the meetings, partner agencies are asked to review the actions that they are the lead agency for and provide an update on the action's status and an associated comment. They are also requested to provide information on the project cost (where known), resource requirements, year scheduled and whether it has been budgeted for.

During the Implementation Committee meeting, the updated workplan is reviewed and any major changes are discussed prior to being made to the work plan. For example, projects may stall due to unforeseen circumstances or become a low priority for an agency. Likewise, new actions may be identified and require discussion to determine if they meet the vision and at least one of the following objectives as identified in Section 3.1 of Corangamite RFMS:

Objective 1: Assess flood risk and share information
Objective 2: Build a flood-resilient community
Objective 3: Reduce existing flood risks
Objective 4: Avoid future flood risks
Objective 5: Manage residual flood risks
Objective 6: Protect and restore floodplains for their ecological values
Objective 7: Protect and restore the cultural values of floodplains.

Implementation Committee meetings also provide an opportunity to discuss any issues agencies may be having with delivery of actions or getting actions started.

Regional Workplan and Implementation Table (Updated May 2023)

» In progress ✕ Not yet started ✓ Completed New Priority Not a priority now

Table 4 Regional Workplan and Implementation Table (updated May 2023)

DEECA			
Action	**Priority**	**Status**	**Comments**
Action 61: In partnership with other stakeholders, DEECA will work to identify coastal protection assets that may be affected by coastal inundation in the foreseeable future and assess future management problems.	Medium	✕	The CCMA have been unable to get an update on this action from DEECA. GORCAPA are in conversation with DEECA regarding their assets I.e., Fairhaven Surf Life Saving Club.
Action 62: Work together with coastal asset owners and managers to identify those coastal assets that may be adversely affected by coastal processes in the foreseeable future and require adaptation planning.	Medium	✕	See above
Borough of Queenscliffe (BoQ)			
Action	**Priority**	**Status**	**Comments**
Action 92: Investigate upgrades to the building code to reflect more accurate riverine flood data for Lake Victoria. **This action was changed to: 'Investigate the flood risk from Lake Victoria in relation to future development.'**	Medium	✕	CoGG have said that the Lake Victoria flood study has been completed except for the floor level survey which still needs funding. CoGG and BoQ to discuss model outputs

Borough of Queenscliffe			
Action	**Priority**	**Status**	**Comments**
Action 93: Develop a Municipal Flood Emergency Plan (MFEP), incorporating available coastal storm surge information.	Medium	»	The City of Greater Geelong has completed a Geelong Queenscliff Coastal Inundation Catchment Flooding Emergency Response planning Project. The MFEP for BoQ is still to be completed.
Action 94: As a follow up to the Coastal Hazard Assessment, develop an adaptation pathways plan.	Medium	»	The City of Greater Geelong has completed a Geelong Queenscliff Coastal Inundation Catchment Flooding Emergency Response planning Project. The adaptation pathways plan for BoQ is still to be completed.

City of Ballarat (CoB)			
Action	**Priority**	**Status**	**Comments**
Action 40: Investigate options to address the risks around the earthen embankment along Charlesworth Street. This is under way.	High	»	Concept design deemed feasible. Minimal properties affected. CoB had engaged external consultant. Currently at initiation stage, next stage is to issue tender. Anticipated completion in Q1 2025.
Action 41: Develop an evacuation plan for retirement village downstream of Charlesworth embankment; consult with VICSES, Victoria Police (VicPol) and LGA. An ANCOLD Assessment/Dam Break has been completed.	High	»	This is connected to Action 40 as the Retirement Village is directly downstream of the proposed new Road embankment in Charlesworth Street. Consultation with Retirement Village is scheduled (FY 2023-24) after design phase.
Action 42: Investigate options to improve management of Gong Dam. The Gong Dam has considerable stability and seepage concerns, as well as significant downstream consequences that all present risks to the community.	High	»	The Gong Dam wall is immediately upstream of the Buninyong Botanic Gardens. Numerous hydrologic and geotechnical investigations have been completed. A draft design was prepared. The community and Friends of the Buninyong Botanic Gardens had reservations about the project, and it was stalled. A Masterplan has been prepared and will be endorsed by Council (FY2023-24) and that endorsement will pave the way for the Gong Dam project to recommence in the FY 2023-24. Anticipated construction commencement in late 2025.

City of Ballarat			
Action	**Priority**	**Status**	**Comments**
Action 43: Investigate options to improve management of Gnarr Ck through the CBD with a particular focus on including any upgrades in partnership with planned VicRoads upgrades for Mair Street.	Low		Priority has been downgraded due to new flood modelling showing reduced impact. Design is completed although it should be reviewed along with a cost benefits ratio. No funding has been provided for this project.
Action 44: Investigate options to improve augmentation of Yarrowee upstream of CBD.	Medium		This priority was changed from High, to Medium, given new flood modelling showed a slight reduction in the flood extents around the CBD. Drainage upgrades are also expected to reduce flood extents for Curtis Street and Bridge Mall.
Action 45: Update Planning Scheme to include flood controls for the whole City of Ballarat.	High		The 2019 flood studies are currently being updated in preparation for a Planning Scheme Amendment (PSA) that will run across 2023 / 2024.
Action 85: Update flood study for Yarrowee River tributaries (Brown Hill) including Warrenheip Creek, Ryan Street drain, etc. (current mapping Ballarat Risk and Opportunity Mapping 2016).	Medium		The 2019 flood studies are currently being updated in preparation for a PSA that will run across 2023 / 2024.
Action 86: Update Canadian Creek Flood Study, including investigation of Emergency Services Telecommunications Authority (ESTA) facility's proximity to the floodplain.	Medium		The 2019 flood studies are currently being updated in preparation for a PSA that will run across 2023 / 2024.
Action 87: Update flood study for Buninyong (Union Jack Creek catchment). The City will first organise drainage and culvert data. Then a flood study will be completed for the waterways and local drainage network. The flood study will consider emergency management, future flood overlays and future planning for town.	Low		Priority has been downgraded due to minor flood extents compared to other catchments and low development activities in that area. CoB is currently doing Buninyong Dam Wall update project. Union Jack Creek flood study to follow post 2025 after completion of Buninyong Dam Wall project.
Action 88: A consultant will undertake a review of the Bonshaw Creek Flood Study, which will include the Redan Creek.	Medium		The 2019 flood studies are currently being updated in preparation for a PSA that will run across 2023 / 2024.
Action 89: Update Kensington Creek catchment flood study (current mapping Ballarat West Drainage Scheme Halcrow 2007 and Ballarat Risk and Opportunity Mapping 2016).	Medium		The 2019 flood studies are currently being updated in preparation for a PSA that will run across 2023 / 2024.

City of Ballarat			
Action	**Priority**	**Status**	**Comment**
Action 90: Update flood study for little Bendigo Creek catchment including Hit Or Miss Gully (current mapping Ballarat Risk and Opportunity Mapping 2016)	Medium	✓	The 2019 flood studies are currently being updated in preparation for a PSA that will run across 2023 / 2024.
Action 91: Investigate the viability of a flood warning system for the city, e.g. methods to turn flood study outputs into tools to assist with flood warning, preparedness and response.	Low	✗	No further investigations undertaken other than some information gathered on warning systems available. State Government funding for flood warning for 2023-24.
Action 105: Update flood study for Yarrowee River downstream from Canadian Creek confluence to COB boundary (current mapping DELWP Regional Floodplain Mapping 2016 and Ballarat Urban Waterways Floodplain Mapping Report 2007).	Low	✓	The 2019 flood studies are currently being updated in preparation for a PSA that will run across 2023 / 2024.
Action 106: Investigate options to improve flood situation for Banyule Drive, Glenelg Highway and Doug Dean Reserve. Assess flood mitigation options for areas such as Victoria Park, Doug Dean and the former saleyards site.	Low	⋙	The former Saleyards Site in Latrobe Street is currently subject to a design process to provide housing which will be used for the 2026 Commonwealth Games athletes. This includes a detention basin/wetlands. No current investigation is underway for a detention basin in Victoria Park. Doug Dean reserve – upstream of Banyule Drive has seen a Detention Basin/Wetlands constructed about 10 years ago and upgrades to drainage in Banyule Drive and under the Glenelg Hwy embankment occurred about 12 years ago.
Action 107: Upgrade flood modelling for Gnarr Creek catchment upstream from Howitt St, including Walker St Drain and Devils Gully (current mapping Ballarat Urban Waterways Floodplain Mapping Report 2007 and Ballarat Risk and Opportunity Mapping 2016).	Low	✓	The 2019 flood studies are currently being updated in preparation for a PSA that will run across 2023 / 2024.
Action 108: Investigate the feasibility of a road inundation assessment (e.g. depth of over road flooding) to assist the City and SES plan for road closures during floods and to better plan for potential road damages.	Low	✓	Complete. Flood gauges and information boards placed throughout the city in partnership with SES.

City of Greater Geelong (CoGG)			
Action	**Priority**	**Status**	**Comments**
Action 32: Support the implementation of the Barwon and Moorabool River flood study.	High	⋙	Geelong PSA currently going to panel – second attempt.
Action 33: Ensure that relevant components of the Barwon and Moorabool flood study are operationalised. For example, updating the MFEP to include: • inundation plans that include above floor flooding • impacts on significant infrastructure • key triggers for evacuations and road closures.	High	✓	Complete
Action 35: Complete flood and drainage strategy for Lara.	High	✓	Complete
Action 36: Implement recommendations from the Lara flood and drainage study, for example updating the MFEP to include: • inundation plans that include above floor flooding • impacts on significant infrastructure • key triggers for evacuations and road closures.	High	⋙	Structural drainage upgrade works derived from Lara Flood Study and Flood Emergency Management Plan actions still in development. These may require additional funding. Planning Scheme amendment to implement relevant zones/overlays has been abandoned. One drainage scheme designed around Kiama Drive, funding deferred until next FY 23/24. MFEP has been updated in August 2022.
Action 37: Implement recommendations from the Lara Flood Levee Audit, SMEC 2016.	High	✓	Levee Asset Management Plan complete - asset management/inspection to be implemented
Action 38: Investigate the most appropriate planning process to ensure flood study outputs from the *'Our Coast'* program are incorporated into the Planning Scheme.	High	✓	Complete
Action 39: Identify and address existing flood data gaps and future data needs in relation to flood risk in and around land development and where riverine and stormwater are identified as a joint risk. For example, Drysdale, Clifton Springs, Leopold, Armstrong Creek, Ocean Grove, Waurn Ponds and Cowies Creek areas.	High	✓	Considered complete as the Stormwater Services Strategy and MFEP commits to a program of flood info updates. Ongoing through stormwater strategy

City of Greater Geelong			
Action	**Priority**	**Status**	**Comments**
Action 81: Identify priority locations for new rain and streamflow gauges within the City area and seek to add these to the Regional Water Monitoring Partnership.	Medium	⋙	Part of a digital transformation project for the City of Greater Geelong. Looking at feasibility of upgrading irrigation rain gauges to a suitable standard for flood model calibration 25-30 sites.
Action 83: As part of the Coastal Hazard Assessment, develop an adaptation pathways plan and implement the recommendations from this adaptation pathways plan.	Medium	⋙	The City has completed a Geelong Queenscliff Coastal Inundation Catchment Flooding Emergency Response planning Project. CoGG have started the Corio Bay Coastal and Marine Management Plan and are doing some more mapping work in relation to coastal erosion in Corio Bay.
Action 84: Investigate options for flash flood warning systems for Geelong	Medium	✕	Sites or funding yet to be identified/prioritised
Action 103: Review the need for a flood study for Anakie Township.	Low	✓	Review was done as part of Stormwater Strategy. Identified as Medium term priority
Action 104: Investigate the opportunity to undertake a Bellarine peninsula Regional Opportunity Mapping project.	Low	⋙	Catchment Management Strategies for communities on the Bellarine underway (committed in Stormwater Services Strategy i.e. Ocean Grove (underway), Drysdale, Clifton Springs (completed). Flood studies have been undertaken for Drysdale and Clifton Springs (included Integrated Water Management (IWM) options analysis).
Colac Otway Shire (COS)			
Action	**Priority**	**Status**	**Comments**
Action 23: Complete the Colac Drainage Strategy, identify relevant floodplain management actions and prepare a detailed prioritised implementation plan.	High	✓	Strategy complete. Looking at one project a year for funding for design and delivery. Completion of some projects has now occurred.
Action 25: Complete the process for Planning Scheme Amendment C90.	High	✓	Complete

Colac Otway Shire			
Action	**Priority**	**Status**	**Comments**
Action 28: Seek funding support to undertake a flood study for Birregurra, with the potential to develop an integrated flood and drainage strategy for the town. Ensure this flood study includes above-floor flooded property data.	High	✓	Complete
Action 29: Following the completion of a Birregurra flood study, amend the Planning Scheme to update it with the new flood maps and requirements.	High	✓	Complete
Action 30: Seek funding support to undertake a flood study for the Barham River in Apollo Bay.	High	✗	Council budget not allocated for 2022/23, aiming for RRGS and council budget to follow 23/24 Project is in the list to DEECA for their 100% funding of flood studies (high) priority.
Action 31: Investigate the feasibility of a road inundation assessment (e.g. depth of over road flooding) to assist council and VICSES plan for road closures during floods and better plan for potential road damages.	High	✗	Not started. Is there any possible funding for this?
Action 77: Colac 2050 Growth Plan to consider flood risks and provide strategic directions to address the issues for potential future growth areas.	Medium	✓	Complete
Action 78 : Investigate the feasibility of an appropriate flood warning system for Colac.	Medium	✗	Not started (priority is more so for Birregurra in this space)
Action 79: Develop a flood warning system for Birregurra, particularly for the smaller creeks through town.	Medium	⋙	Flood warning options developed in the draft Flood Study, but further work required to refine & implement. Possible funding available for this project (CoS to confirm.)

Colac Otway Shire			
Action	**Priority**	**Status**	**Comment**
Action 80: Seek funding to review the priority retarding basins in Colac, e.g., investigate the benefits of current retarding basins, and whether their flood storage function is adequate and should be upgraded/removed/ maintained.	High		Irrewillipe Basin / Elliminyt Wetlands grant was successful. Design works underway. Council negotiating with a developer of land being rezoned at Harris Road in the south-east of Colac to incorporate detention of stormwater runoff from an adjoining estate that contributes to downstream flooding. Works about to commence on Deans Creek PSP studies, including stormwater and IWM.
New: Colac retarding basins - Following review of the priority retarding basins in Colac, design and construct flood mitigation works	High	 	Works underway on design and construction of Elliminyt wetlands. Works underway on IWM and stormwater management for Deans Creeks PSP. Progressing plans for new retention system in south-east of Colac at Harris Road, Elliminyt with rezoning application to capture stormwater from adjoining residential areas that contributes to downstream flooding.
New: Following Birregurra flood study, design and construct flood mitigation works.	High	 	Range of actions identified in Flood Study Mitigation Options Report. Business case to Council has not yet been accepted due to high cost of interventions required
New: Due to the completion of the Kennett River and Skenes Creek Concept Stormwater Management Plans, the Planning Scheme should be amended and updated with the new flood maps and requirements.	Low	 	This has been identified in the 2023 Planning Scheme Review and Council will amend its planning scheme in the next few years to update the mapping

Corangamite Catchment Management Authority (CCMA)			
Action	**Priority**	**Status**	**Comments**
Action 4: Update flood levels that have been declared under section 202 of the Water Act on the lower Barwon River.	Low		Not started. Considerable cost involved.
Action 5: Corangamite CMA will report to DEECA all cases of non-compliance with council planning controls and investigate opportunities for MAV education through the VFMS implementation committee.	High		To date, the CCMA are not aware of any non- compliance

Corangamite Catchment Management Authority (CCMA)			
Action	**Priority**	**Status**	**Comments**
Action 14: Prepare a Memorandum of Understanding (MOU) between the relevant agencies and stakeholders to ensure a coordinated approach to the management of artificial estuary openings.	High	✓	This action was modified after the MOU path was unsuccessful. A Guidance Note was created instead
Action 15: Develop communication material around the dynamics of artificially opening the estuary (e.g. river water levels to tide heights and lack of fall), specific to the Curdies system.	High	✓	Complete
Action 24: Identify the above-floor flooded properties from the Deans Creek and Barongarook Creek Floodplain Mapping Project (DELWP 2016).	High	✓	Completed via RRGS funding
Action 47: Investigate options to improve flood intelligence gathering following major floods. These could include: use of drones; use of portable automated loggers; how to acquire flood information from social media during and post flood events/major rainfall; procedures for improving intelligence gathering following coastal flooding (storm surges).	Medium	⋙	Note: DEECA deploy portable automated loggers to capture flood intelligence during flood events. VicSES have developed the Snap Send Solve flood app to enable SES volunteers to capture flood information and send through to IC during a flood event.
Action 48: Update the Corangamite CMA flood portal to include more information. For example: additional flood extent data (e.g. 10%, 20% AEP flood information); rainfall data; flood study reports.	Medium	✓	Flood portal updated with all recent flood studies (updates now ongoing)
Action 49: When assisting LGAs to write project briefs for new flood studies, include requirements to: develop animations of flood behaviour the VICSES can use in the development of community flood awareness videos; develop a spreadsheet relating surveyed floor level to flood level for each design event (This information can be used to develop property specific flood warning charts); incorporate all flood study information into MFEPs.	Medium	✓	Complete and now business as usual
Action 51: Continue to collect information and document case studies on storm surges, and other extreme climatic events.	Medium	✓	Ongoing as needed. Kits have been developed.

Corangamite Catchment Management Authority (CCMA)			
Action	**Priority**	**Status**	**Comments**
Action 52: Undertake a baseline mapping exercise to establish the ecological values and associated threats to floodplains in the region to inform decision making for planning purposes.	Medium	✕	Not started.
Action 53: Investigate the loss of vulnerable coastal floodplains as a result of sea level rise and plan appropriate management responses.	Medium	✕	Not started
Action 54: Prioritise structural assets that are at risk from estuarine flooding and investigate mitigation measures for their protection in high growth areas. **(re-described. The original wording was: *Investigate reinstating natural hydrological regimes (where relevant) on floodplains once threats and values have been determined*).**	Medium	✕	Not started. Difficulty in obtaining funding for these types of projects.
Action 55: Improve knowledge of storm surges around estuarine systems to inform understanding of such systems and therefore any development proposals on estuarine floodplains.	Medium	✕	Not started
Action 56: Investigate methods to apply for funding for Cultural Heritage asset mapping following major flood events.	Medium	⋙	CCMA and Golden Plains Shire had a meeting with Wadawurrung Traditional Owners Corporation to include a Cultural Heritage Risk Assessment as part of the Teesdale Flood Study grant application.
Action 57: Investigate methods of including Aboriginal cultural values in flood response planning processes, which may include but is not limited to risks to cultural assets after flood events and notification of flood events to relevant Traditional Owner corporations (e.g. Municipal Flood Emergency Plans could include information regarding these risks, including notifying the relevant Registered Aboriginal Party).	Medium	✕	Not started. Suggest a Floodplain Managers Forum subgroup to work with a Traditional Owners (T.O.) representative to work through this.

Corangamite Catchment Management Authority (CCMA)			
Action	**Priority**	**Status**	**Comments**
Action 58: Investigate holding two-way cultural exchange workshops with Traditional Owners and floodplain agencies on Aboriginal cultural values of floodplains and CMA floodplain management.	Medium	✗	Not started. Suggest a Floodplain Managers Forum subgroup to work with a T.O. representative to work through this.
Action 59: Investigate methods of identifying and protecting coastal midden sites where they are being exposed due to coastal flooding and erosion.	Medium	✗	Not started. Suggest a Floodplain Managers Forum subgroup to work with a T.O. representative to work through this.
Action 60: Investigate how to improve coordination/ alignment between Cultural Heritage Management Plan process and Corangamite CMA referral processes.	Medium	✗	Not started. Suggest a Floodplain Managers Forum subgroup to work with a T.O. representative to work through this.
Action 66: Work with water corporations to make Geographic Information System (GIS) data for flood-prone areas available to allow consideration in planning and assess changes in risk to existing assets.	Medium	⋙	Shared data with Central Highlands Water now complete. Need to meet with Barwon Water to see if they have received the Geelong flood study data.
Action 76: Seek funding to investigate the berm dynamics for the lower Gellibrand River estuary. This action needs to link with any Coastal Hazard Assessment and could include recommendations for planning controls in estuarine areas.	Medium	✓	Project complete
Action 82: Investigate how to add the Barwon River flood warning system to the regional water monitoring partnership (RWMP).	Medium	✓	Complete
Action 95: Investigate how to improve Corangamite CMA flood photography database.	Low	✗	Not started
Action 96: Develop and maintain a property GIS database of all flood prone properties resulting from flood studies.	Low	✓	Project completed. Ongoing with new flood studies

Corangamite Catchment Management Authority (CCMA)			
Action	**Priority**	**Status**	**Comment**
Action 102: Seek funding to investigate the berm dynamics for the lower Aire and Barham estuaries. This action needs to link in with any Coastal Hazard Assessment and could include recommendations for planning controls in estuarine areas.	Low	✓	Project complete
New: Re-run the 'Our Coast' model to include 2070 levels (40cm sea level rise)	High	✓	Project complete
New: Undertake a flood risk management study of the Upper Barwon River to better inform flooding of the upper catchment, impact to roads and to complete the flood model of the catchment.	High	✗	Scoping started
Corangamite Shire			
Action	**Priority**	**Status**	**Comments**
Action 21: Continue to support the implementation of the Coastal Hazard Assessment for the Barwon South West coastline. Ensure that the outputs from this assessment meet the needs of the Shire and the CCMA.	High	✗	Corangamite approached other coastal Councils to identify if there was interest in recent coastal hazard funding. At that stage council were not in a position to apply for funding due to resource constraints. Stalled at council level but possibly other avenues via GORCAPA
Action 22: Investigate a regional flood mapping project for the whole shire to identify key rural flow paths and provide advice on where overland flow paths might affect assets (including agricultural assets and roads, rail, drainage). This will include road inundation assessment (e.g. depth of flooding over roads) to assist the Shire and SES plan for road closures during floods and to better plan for potential road damages.	High	»	Phase 1 expected to be completed by September / October – data availability assessment has been completed. Next stage is a pilot project – a mini flood study in the Curdies River to test the process and Rain on Grid modelling across the region to help determine priorities. This will determine the overall data and budget for the larger project. Funding applications have commenced for Stage 2 works to gather further data where gaps have been identified.

Coastal Committees of Management (CoM)			
Action	**Priority**	**Status**	**Comments**
Action 6 : Bellarine Bayside CoM will undertake coastal inundation investigations for the Portarlington Holiday Park to improve its resilience.	High	✓	complete
Action 7: Barwon Coast CoM will apply CFAST inundation modelling to Riverview Family Caravan Park to determine adaptive protection approaches to enhance security of the caravan park from impacts of coastal and riverine inundation.	High	✓	Action relates to modelling completed in 2019, which was fed into the design response. Design response is part of DEECA led river revetment project.
Action 8: Barwon Coast CoM will investigate mechanisms to improve flood planning and response for two coastal caravan parks under management of Barwon Coast CoM: the Riverview Family Caravan Park and Barwon Heads Caravan Park.	High	✓	Emergency management plans for all caravan parks and camping reserves are complete.
Action 9: GORCAPA will Investigate a risk-based project to identify and prioritise assets managed by the Authority at risk from flooding (riverine, coastal storm surge, sea level rise) and establish a program to evaluate the risks and develop mitigation actions. Include early warning system that could help identify risks and implement actions such as estuary openings, event cancellations, etc.	High	⋙	Risks identified. Multiple new caravan parks on board now. Will need to further identify what new assets are included.
Action 10: GORCAPA will Investigate mechanisms to improve flood planning and response for coastal caravan parks on GORCAPA-managed land.	High	⋙	Underway
Action 67: Barwon Coast CoM will, in response to CHA modelling for inundation, develop flood prevention strategies for lower lying facilities and areas around Flinders Parade, Barwon Heads.	Medium	✓	Complete Flood strategies relating to residential areas to be reassigned to COGG

Coastal Committees of Management (CoM)			
Action	**Priority**	**Status**	**Comments**
Action 97: Bellarine Bayside CoM will investigate mechanisms to improve flood planning and response for coastal caravan parks managed by Bellarine Bayside CoM.	Low	✓	Complete
New: Bellarine Bayside CoM will develop local climate change adaptation planning in relation to inundation and coastal processes	Low	⏱ ⋙	Have commenced work on the development of a climate change and coastal processes adaptation plan, which will include mitigation measures and a monitoring program
New: GORCAPA will update GORCAPA Emergency Management Plan (includes flood considerations) to include newly acquired caravan parks	High	⏱ ✓	Completed but they may need to be refined. Implemented at Lorne/Apollo Bay rec reserve
New: GORCAPA will develop a climate change policy and strategy	High	⏱ ✗	On GORCAPA's priority list but remains unfunded
New: GORCAPA will investigate Wye River inundation and erosion mitigation planning	High	⏱ ⋙	The coastal adaptation options report is now completed. Further adaptation planning work is required for the township as a whole, this will be picked up in the Pt Impossible to Warrnambool CHARP by 2025.
New: GORCAPA will investigate Kennett River flooding and stormwater issues.	Medium	⏱ ✗	GORCAPA will work with Colac Otway Shire regarding their recent riverine and stormwater flood study and close out this action if no further work required.
New: GORCAPA will investigate Skenes Creek inundation and erosion mitigation options	Low	⏱ ✗	GORCAPA will work with Colac Otway Shire regarding their recent riverine and stormwater flood study and close out this action if no further work required.
New: GORCAPA will undertake a scoping study – from Point Impossible to Warrnambool Coastal Hazard Resilience and Adaptation Plan	Medium	⏱ ⋙	Grant funding received Scope prepared, will tender once the Authority has suitably qualified resources in place to manage the project. Recruitment underway

Coastal Committees of Management (CoM)			
Action	**Priority**	**Status**	**Comments**
New: GORCAPA will undertake the Anglesea Coastal Hazard Resilience and Adaptation Plan	Medium		Grant funding received - project currently undergoing tender stage. Anticipated to be completed by end of 2023.
New: GORCAPA will lead the North Lorne Coastal Hazard Investigation	Medium		Coastal hazard exposure report and asset vulnerability assessment completed (includes coastal inundation). Community consultation not yet complete
New: GORCAPA investigate options for Cosy Corner Seawall Upgrades	High		Interim protection complete. Currently finalising project manager to complete long term adaptation works.
New: GORCAPA is to lead the Point Impossible to Warrnambool Coastal Hazard Assessment	Medium		Project complete
Department of Transport & Planning (DTP)			
Action	**Priority**	**Status**	**Comments**
Action 11: Undertake a first pass risk assessment using in-house information to identify flooding hot spots, including identifying known flood-prone sections of the DTP network and where flood recovery works were carried out in the last year.	High		Pushed back project
Action 68: Review and where required update the culverts register and confirm condition and adequacy of their capacity prioritising the flood-prone locations and where necessary prepare upgrade/replacement strategy	Medium		Culvert review Completed

Golden Plains Shire (GPS)			
Action	**Priority**	**Status**	**Comments**
Action 18: Continue to support the implementation of the 2017 Inverleigh Flood Study, including an update to the Planning Scheme and MFEP once new flood data is available.	High	✓	PSA and MFEP complete.
New Action: Investigate flood mitigation design options for Inverleigh (following on from recommendations from Inverleigh Flood Study)	High	↱ ⋙	Funding has been provided and consultant engaged to provide a geotechnical assessment of the current levee, engage with Wadawurrung regarding cultural heritage and develop a functional design of the levee.
Action 19: Act on recommendations from Inverleigh Flood Study for improvements to the flood warning system for the study area.	High	⋙	Looking at options for cameras on gauge boards.
Action 20: Undertake a detailed flood study for Teesdale. Follow up with a PSA. (**Re-described. Original wording was: Undertake a desktop review of the Regional Floodplain Mapping Project in comparison with current planning flood overlays to determine if an upgrade to the planning scheme is required, particularly for areas where there is development pressure.)**	High	⋙	Flood study almost complete.
Action 73: Review the damages to Shire infrastructure as a result of the 2010-2011 floods, to inform potential management actions, i.e. map out the location of damages on a GIS system. Completion of this action is likely to be data and personnel dependent.	Medium	✗ ↳	No longer a priority.
Action 74: Develop a brochure to ensure potential purchasers and the public inform themselves (undertake due diligence) when considering potentially flood-prone land.	Medium	✓	Complete
Action 75: Develop a Guidance Note on appropriate design for recreational infrastructure in flood-prone land.	Medium	✗	DELWP are not aware of this action. Recommend CCMA lead this action and have a meeting with GPS / CoGG
Action 100: Investigate the feasibility of a road inundation assessment (e.g. depth of over road flooding) to help the Shire and the VICSES plan for road closures during flood events and to better plan for potential road damages.	Low	⋙	Partially stalled. Flood gates have been installed at 5 key locations across the Shire to increase road safety during floods at those sites. No road inundation assessments have been completed. There are a lot of causeways and low bridges in the shire that are subject to inundation.

Moorabool Shire			
Action	**Priority**	**Status**	**Comments**
Action 16: Investigate a regional flood mapping project for the Corangamite CMA portion of Moorabool Shire to identify key rural flow paths, provide information on where overland flow paths might affect assets and to inform a future amendment to the Planning Scheme to introduce flood controls. This will include a road inundation assessment to assist Shire and VICSES plan for road closures during floods and to better plan for potential road damages.	High	✗	Not started. No update as to when action will commence.
Action 17: Investigate the potential to undertake a flood study for Gordon, based on the town's growth potential, to ensure that flood risk associated with proposed development is either avoided or mitigated. The flood study will inform a future amendment to the Planning Scheme to introduce flood controls for Gordon.	High	✗	Not started. No update as to when action will commence.
Action 72: Undertake flood studies for priority towns where structure plans are proposed, including Wallace and Dunnstown. Council is currently pursuing the flood study for Bungaree. The flood studies will inform a future amendment to the Planning Scheme.	Medium	✓	Completed. Wallace Flood Study was completed in January 2022. Bungaree Flood Study was completed in 2018.
Moyne Shire			
Action	**Priority**	**Status**	**Comments**
Action 98: Assess the costs and benefits of investing in modifications to existing public assets and infrastructure at risk of flooding, e.g,. Dorey Street.	Low	✗	MSC to review potential funding sources to progress
Action 99: Investigate the feasibility of undertaking a coastal vulnerability assessment for Peterborough township, including the effect of sea level rise, storm surge and closed estuary mouth flooding on Peterborough.	Low	✗	No action to date. MSC to review potential funding sources to progress

Surf Coast Shire (SCS)			
Action	**Priority**	**Status**	**Comments**
Action 12: Investigate the feasibility of undertaking a flood study for the Anglesea River to investigate short and long term inundation risks.	High	✕	There are barriers for Council re: flood studies - both Council resources and required 1/3 contribution. Previous costing for Anglesea flood study was prohibitive and return on dollar and resource investment was not seen as sufficient.
Action 13: Investigate the viability of road closure and flood warning notification systems for key roads: Kildean Rd; Horseshoe Bend Rd; Ghazeepore Rd; Pettavel Rd; Blackgate Rd (at Merrijig Creek and Thompson Creek); Williams Rd; Dickins Rd; Cressy Rd.	High	⋙	The MFEP is currently underway and will be added to new version. This is happening informally
Action 69: Review the current flood warning procedure and key decision points involved with the management of the Painkalac Creek estuary mouth with a view to update/amend if required.	Medium	✓	The Procedure has been reviewed and updated with support from the CCMA. Action complete.
Action 70: Undertake targeted community education with flood-affected residents in Aireys Inlet	Medium	✓	Community door knocking was completed December 2022 of the 50 identified impacted properties. Community forum delivered June 2021 VICSES updated Local Flood Guide and consultation occurred during the above events. Planning to do a final drop-in session in the Aireys community in 2023.
Action 71: Investigate the feasibility of a flood study for Painkalac Creek to investigate short and long-term inundation risks.	Medium	⋙	Seed funding provided for scoping and planning but not for completion.(CCMA have developed a flood model in house) Painkalac Working group formed funding applications submitted to improve monitoring and coastal modelling.

VICSES			
Action	**Priority**	**Status**	**Comments**
Action 1: Install community education signs and gauge boards at high priority locations across the region to raise community flood risk awareness and provide links to websites with more detailed flood risk information.	High	✓	2021-22, installation of Flood risk signage/boards to be permanently located at key flood areas: Lake Wendouree (west and east), Miners Rest, Brown Hill, East Ballarat, Golden Point, Mt Clear, Sebastopol. 2021: “Flood Risk Area” info signs installed around Greater Geelong – multiple locations at Armstrong Creek, Barwon River, and Hovells Creek.
Action 2: Investigate options to improve community access to website flood risk information to allow people to better plan, prepare and respond to flooding.	High	✓	Complete
Action 3: Update MFEPs to incorporate the latest flood study intelligence and school bus runs impacted by flooding.	High	✓	Complete and ongoing
Action 26: Undertake community flood education engagement activities and develop flood awareness products for Colac that may include pre-recorded flood education videos, local flood guides, community response plans, community signs and gauge boards.	High	›››	On 14 November 2022, the Colac Unit ran a property flood protection session (centred on sandbagging) for Birregurra residents, at Birregurra CFA Station. (Noting that CCMA identify Birregurra as a priority for flood warnings over Colac).
Action 27: Work with Barongarook nursing home and the nursing home on Murray Street, Colac to develop a Flood Response Plan.	High	✓	VICSES followed up with the Regional Manager or Cavalry Care which operate the facility. There is an internal Evacuation Emergency Plan, however no Flood Response Plan. Mitigation works have been done prior to ownership of Calvary Care.
Action 34: Undertake community flood education activities and develop flood awareness products for Geelong that may include pre-recorded flood education videos, local flood guides, community response plans, community signs and gauge boards. This work will include educating the community about the role of retarding basins in floodplain management.	High	›››	Completed Lara LFG and the Batesford LFG within the last 12-18 months. Barwon Heads/Ocean Grove LFG yet to be updated. Community signs completed as part of Action 1. Partnered with Geelong Tech School on the Industry Design Sprint – working with students from Geelong area secondary schools to gain understanding of Geelong’s flood risks, and for them to use this knowledge to develop solutions that address identified risks. *The intent during 2023-2024 is to develop public info materials on flash/urban flooding (incorporating info on retarding basins) and completing and releasing the Geelong LFG for the Barwon River. Each with social media, videos etc.*

VICSES			
Action	**Priority**	**Status**	**Comments**
Action 46: Undertake community flood education engagement activities around Ballarat and develop flood awareness products that may include pre-recorded flood education videos, local flood guides, community response plans, community signs and gauge boards.	High	⋙	South West region has not done any local videos due to Covid-19 restrictions around community engagement. Social media was utilised instead.
Action 50: Develop a State Community Observers Network Website enabling the community to provide local knowledge during a flood. Using smartphones to collect flood data via an app, photos can be instantly uploaded to the web page, viewed and shared between agencies and the community.	Medium	✓	Complete
Action 63: Investigate data sharing opportunities between Barwon Water and key agencies to provide better flood warning services. This may include the sharing of: rainfall data, river level data, storage rating table data, historical spill information, flood modelling completed for river reaches of interest to Barwon Water.	Medium	✓	Complete
Action 64: Investigate data sharing opportunities between Central Highlands Water and key agencies. This may include the sharing of: rainfall data, river level data, flood modelling completed for river reaches of interest to Wannon Water.	Medium	✓	Complete
Action 65: Investigate data sharing opportunities between Wannon Water and key agencies to provide better flood warning services. This may include the sharing of: rainfall data, river level data, storage rating table data, historical spill information, flood modelling completed for river reaches of interest to Barwon Water.	Medium	✓	Complete
Action 101: Investigate opportunities for improving education and understanding of the flood warning system for communities on the Moorabool River.	Low	✓	Complete – incorporated into action 34

Acronyms

ANCOLD	Australian National Committee on Large Dams
CBD	Central Business District
CCMA	Corangamite Catchment Management Authority
CFAST	Consolidated Model of Fire and Smoke Transport
CHA	Coastal Hazard Assessment
CHARP	Coastal Hazard Adaptation and Resilience Plan
CoB	City of Ballarat
CoGG	City of Greater Geelong
COM	Committee of Management
DEECA	Department of Energy, Environment and Climate Action
DTP	Department of Transport & Planning
ESTA	Emergency Services Telecommunications Authority
GIS	Geographic Information Systems
GORCAPA	Great Ocean Road Coast and Parks Authority
GPS	Golden Plains Shire
IC	Implementation Committee
LFG	Local Flood Guide
LGA	Local Government Authority
LSIO2	Land Subject to Inundation Overlay – Schedule 2
MAV	Municipal Association of Victoria
MER	Monitoring, Evaluation and Reporting
MFEP	Municipal Flood Emergency Plan
MOU	Memorandum of Understanding
NWGGA	North and Western Geelong Growth Areas
PSA	Planning Scheme Amendment
RFMS	Regional Floodplain Management Strategy
RRGS	Risk Resilience Grants Scheme
RWMP	Regional Water Monitoring Partnership
TBC	To Be Considered
TO	Traditional Owner
VFMS	Victorian Floodplain Management Strategy
VicPol	Victoria Police
VICSES	Victorian State Emergency Service