GETTING LEVEE MANAGEMENT RIGHT IN VICTORIA

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Abstract

The 2010-11 floods in Victoria, subsequent inquiries, and the Victorian Government's response to the recommendations from those inquiries, has created an expectation that levees need to be better managed in Victoria.

A parliamentary inquiry into flood mitigation infrastructure found that there was a legacy of poor management of many levees which have been constructed in an ad hoc manner over the past 100 odd years. There was also confusion on responsibilities for levee management and shortcomings in the way the local community was involved.

The Government's response to the parliamentary inquiry addresses these issues. It will help set the direction for the Victorian Floodplain Management Strategy, which is due for public release in the second half of 2014. This will reinforce the policy framework for managing urban and rural levees in Victoria that has been established in the Government's response.

This paper discusses some of the challenges and issues faced when managing existing and new levees, and focuses on getting the policy framework right and promoting best practice.

Introduction

The purpose of this paper is to explain how the Victorian government intends to implement levee reforms that address its response to a parliamentary inquiry.

On the whole, new levees are not the problem: they are either maintained by a local Council or Melbourne Water, or they are regulated through planning controls. There are however approximately 4000 km of existing levees that are not being adequately managed.

Levee construction in Victoria

Of the estimated 4000 km of urban and rural levees in Victoria, about 98% are rural levees. About 75 to 80% of these have been privately constructed, either to protect an individual property or to protect a number of farms. Most were constructed before there

were planning controls, and guidelines for design, construction and ongoing maintenance were non-existent.

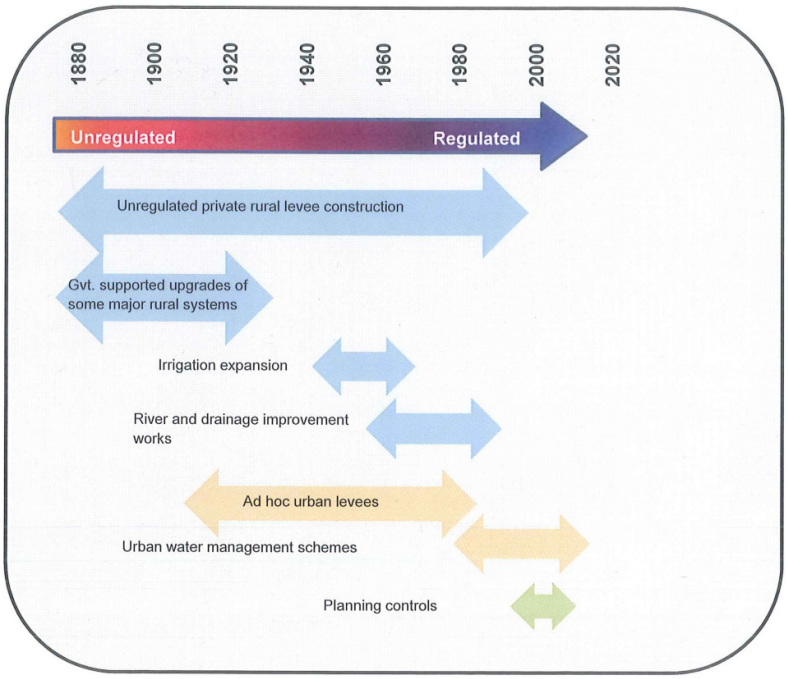
Figure 1 shows how the levees have been constructed chronologically. Work commenced in the late 1800s and early 1900s, mainly along the Goulburn and Murray Rivers. These levees protected large tracts of land from small and moderate floods and were built to protect against previously known flood events. Construction of levees also occurred in many other localities, as individuals or groups of farmers reacted to successions of wet years.

Construction occurred on both private and public land whichever was the most convenient. They were sometimes constructed on or close to the natural river bank, which severely confined the passage of floodwaters and increased the likelihood of failure. These early levees were simple in design, utilising local materials. The majority were built with poor cross-section, little compaction, dry materials and unsuitable soils leading to significant failures during flood events. The nature of flooding was not readily understood by most

The ad-hoc construction of levees occurred right through to the 1970s when planning controls started to be developed and the nature of flooding more readily understood with the introduction of flood studies.

Significant flooding in the 1970s to townships led to the implementation of urban flood mitigation schemes, mainly using levees to prevent flooding of urban areas. These schemes have generally been constructed by councils to the 1% probability flood estimated at the time (plus freeboard). However there are instances where it is assumed that an old levee will protect urban communities, without attempting to ascertain its standard or offset the residual risk with planning controls.

Figure 1: Levee Construction in Victoria



The 2010-2011 floods

From September 2010 to March 2011, many parts of Victoria experienced some of the worst flooding on record. There were seven significant rainfall events, each affecting one to seventeen municipalities. Many municipalities were affected more than once.

Given that rural levees were never intended to withstand the magnitude of floods they faced, it was not surprising that there were multiple failures (see Figure 2). Urban levees performed better, particularly those that were formally maintained.

Figure 2: Levee failure in Lower Loddon

source North Central CMA

Parliamentary Inquiry into Flood Mitigation Infrastructure

The floods led to a number of inquiries, including an inquiry into Flood Mitigation Infrastructure in Victoria by a joint investigatory Committee of the Parliament of Victoria called the Environment and Natural Resources Committee (ENRC). It had a strong community focus.

The terms of reference for ENRC were broader than levees. However the key findings in relation to levees were:

- There were wide disparities in the design, construction methods, access requirements and current condition of the levees, and there was no regular inspection and maintenance.
- There is considerable uncertainty concerning the ownership of, and maintenance responsibilities for, many of Victoria's levees.

- The current permit processes for regulating works on levees are complex and require streamlining.
- Available guidelines, processes and controls for the prioritisation of investment, and for the construction of levee systems, need to be reviewed and expanded.
- Information on levees is required for emergency management planning and for prioritising levee management.

The Government's response to ENRC

The twenty recommendations that relate to levees are the main driver for this paper. They are summarised in Appendix 1, along with the Victorian Government's response. The Government has agreed to fully support or support in principle all the recommendations, reserving the right to meet their intent by a different method or, in some cases, to undertake further analysis of certain aspects of the solution proposed by ENRC.

In general term the Government's response is based on:

- clarifying roles and responsibilities for managing levees;
- building on existing processes and mechanisms and introducing audit requirements;
- reducing reliance on rural levee protection where they are not being maintained;
- transitioning to more sustainable arrangements for formally managing levees; and
- making it easier for private people to maintain levees.

Priority levees

In order to distinguish between levees that are to be formally maintained by an authority and those that are not, ENRC used the term "priority levee". The Government has provided greater clarity by defining a priority levee as one that is formally being managed by an authority to a standard that is appropriate for the property it protects.

Essentially, this means:

- An authority has accepted responsibility for maintaining the levee;
- Formal arrangements are in place for that authority to manage the levee. They include ownership and management responsibilities, design standards, performance standards and audit requirements.
- A revenue stream is dedicated to levee management.
- The levee is listed on the authority's asset register.

Other levees may become priority levees, subject to a process for establishing that most of the beneficiaries are in favour of the levee, and that the levee can be managed in accordance with the criteria outlined above for managing priority levees.

Victoria Floodplain Management Strategy

The Victoria Floodplain Management Strategy will be the centre point for supporting the Government's response. It will replace the Victoria Flood Management Strategy 1998 and is due for public release in the second half of 2014.

The new floodplain management strategy has an intended implementation life of at least ten years and will provide a consistent state-wide framework for the management of flood related issues.

Supporting Best Practice - the Proposed Framework

According to the National Handbook Managing the floodplain: a guide to best practice in flood risk management in Australia, (Australian Emergency Management Institute, 2013) -

> Best practice requires the consideration and management of flood impacts to existing and future development within the community. It aims to improve community flood resilience using a broad risk management hierarchy of avoidance, minimisation and mitigation to:
>
> - limit the health, social and financial costs of occupying the floodplain
> - increase the sustainable benefits of using the floodplain
> - improve or maintain floodplain ecosystems dependent on flood inundation.
>
> To help accomplish this, five key objectives have been identified:
>
> 1. develop sustainable governance arrangements for managing flood risk, so that responsibilities for managing this risk are assigned and clearly understood.
> 2. make information on flood risk readily available so that government, risk managers and community can make informed risk management and investment decisions.
> 3. understand flood behaviour to recognise the impacts of floods on the community and enable effective decisions to be made on flood management.
> 4. understand and maintain the natural flood functions of flow conveyance and storage of the floodplain to enable effective flood risk management and minimise environmental impacts.
> 5. manage flood risk to improve community resilience to flooding, and to handle the potential growth of this risk through development and redevelopment, and future changes to floodplain topography and climate.

These objectives are intended to apply to the full risk management framework (of which levees are a small part). However they do provide a useful starting point for clarifying what best practice may mean for managing levees in Victoria.

In the Victorian context, and in relation to levees, working towards best practice requires:

- consideration of the governance arrangements that apply to different categories of levees according to whether they are to be formally maintained or not, and whether they are located on Crown land or private land
- allowing the benefitting community to decide on what is appropriate for their circumstances, based on the capacity and preparedness to pay for the works

- developing processes and guidance to inform investment decisions, and standards to ensure levees can be managed appropriately
- providing information on flood risk, including the residual flood risk (when levees overtop or fail), and making that information available to a variety of stakeholders
- a funding model that supports formal management of viable levees, including ongoing maintenance ad repair
- policies that require non priority levees to be either privately maintained without increasing the historic standard of protection, or to weather away over time
- consideration of the impacts of new levees in a wider flood risk management framework which aims to improve community flood resilience using a broad risk management hierarchy of avoidance, minimisation and mitigation.

The management framework for flood mitigation infrastructure to be included in the Victorian Floodplain Management Strategy is still being developed through the Strategy preparation process. However it will need to a number of elements, discussed below.

The Beneficiary Contributes Funding Model

One of the most important principles to be applied in the VFMS is that the beneficiary should contribute to the cost of constructing and maintaining a levee. Depending on the scale of the works, beneficiaries may include landowners protected by the levee or landowners whose services are protected by the levee. Governments may also be beneficiaries, for example through reduced repairs to roads and public infrastructure and reduced disaster relief.

The Victorian Government, while clearly a beneficiary, will not contribute to ongoing costs of maintenance. Instead it expects to contribute to the capital costs equally with the other tiers of government (Commonwealth and local).

Where the government contributes funding to upgrade levees or to construct new levees, agreements will be required that clearly identify the beneficiaries, the entity managing the levee on their behalf and the responsibilities placed on that entity. This will ensure that each levee system continues to function to an agreed standard.

New or upgraded levee projects will only be eligible for government funding if they are justified through a local floodplain management plan, which considers a number of options for mitigating flood risk, and they have a favourable cost benefit analysis.

The government will not fund private levees.

Management Arrangements for Levees

Within Melbourne, the accountabilities for flood mitigation infrastructure will remain with their current management agencies (Melbourne Water and local government). Melbourne Water maintains a number of levees within its waterways and drainage area through drainage rates.

Outside Melbourne Water's jurisdiction, local government will continue to take the lead in formally managing urban levees where they have previously been established or proposed under legislation or some other Council endorsed process. Essentially this provides for an investigation into the flood problem and flood mitigation options, an evaluation of the economic, social and environmental costs, an agreed solution and a local Council to implement the scheme and maintain the work. The Victoria Floodplain Management Strategy will also introduce a requirement to audit the condition of the levee periodically.

While local government has also been made notionally responsible for formally managing non-private rural levees, as well as urban levees, the conditions and processes to be followed make this less likely. A benefit cost analysis based on the replacement cost of a rural levee is unlikely to demonstrate that the levee is cost effective, although the upgrading of some rural levees may be cost effective. However the cost of maintenance per beneficiary will be high. It is expected that the decision making will be driven by community desire to fund the long term maintenance based on their appetite for the flood mitigation service.

The Government's preferred mechanism for formal management of levees is as a Water Management Scheme under the Victorian Water Act. The Minister appoints a community based committee to represent the flood affected community, the committee considers the options and endorses a preferred solution. Following an approvals process the Minister appoints an authority to manage the scheme. That authority is expected to manage the levee on behalf of the beneficiaries, with costs being recouped though rates. The management arrangements must include regular inspection and maintenance to ensure that the levee continues to provide the necessary level of protection.

If existing levees are not to be formally managed:

- Levees on private land will be privately managed and regulated through planning schemes.
- Local beneficiaries will have discretion to enter Crown land to maintain a levee provided they comply with conditions of permit issued by a Catchment Management Authority. Part of the licensing arrangements will require the CMA to consult the land managers and ensure compliance with flora and fauna and cultural heritage legislation.

Levee Protection in Rural Areas

Because of the impacts of existing rural levee systems on third parties and on the environmental values of floodplains, they will not be allowed to increase in height (other than to rectify low spots) without a full appraisal of the risk and community acceptance of the levee upgrade. This will require a flood study, analysis and consideration of what can be done to manage adverse impacts, evaluation of cost effectiveness and identifying suitable cost sharing arrangements. Previous standards will be respected but massive levee systems are no longer considered best practice because they reduce flood storage, increase flood levels and the erosion potential within waterways.

There may be situations in which new rural levee systems may be contemplated, to assist environmental watering of forests without impacting on farmland, or reduce the risk of avulsions for example. Therefore the Government will not explicitly rule out new rural levee systems. However they would need to be fully evaluated through a study, and the social, economic and environmental costs and benefits determined. The Government will not fund new rural levee systems that provide a private benefit.

A preferred alternative to promoting new levee systems to protect rural farmland or small settlements is to allow the development of small levees to protect existing individual buildings, machinery sheds and their curtilages. This can be a cost effective flood mitigation measure, as the levees are usually small enough not to have significant third party or environmental impacts. However individual levee protection should not be a substitute for setting the floor levels of new dwellings above the 1% event.

Levee design construction and management guidelines

The Government has also committed to updating guidelines for levee design, construction and maintenance. These are to include:

- guidance on the design, construction and management of flood mitigation infrastructure
- guidance on developing a levee management system
- reference to inspection and provision for third party auditing
- information and guidance on the use of temporary and demountable levees.

Other Guidelines

Supporting material will be required to provide guidance for the levee management framework. This will include guidance on:

- inspection and audit requirements for levees
- streamlining the time and effort required to process permits
- indigenous and cultural heritage.

Policies

Policy direction will be required to reinforce the Government's approach to levee management and to encourage best practices around levee management, for example:

- levees protect property, not lives or peoples' safety, and should not be used to justify new development in areas of high flood risk.
- reinforcing the arrangements for managing levees and maintenance standards, including audit requirements
- requiring contingency plans to manage the residual flood risk
- linking levee protection for communities to a risk management process that will enable a proper evaluation of impacts and a suite of solutions to mitigate the risk, including land use planning.
- specifying the Government's funding model.

Levee Standards

Levee standards, and where they should apply, need to be transparent and fit for purpose. Levees should be designed and constructed by an appropriately qualified expert.

For urban priority levees the level of protection should be established in consultation with the community, guided by an assessment of social and economic benefits, with due consideration of the effect on non-protected properties. For rural levee systems

the level of protection will be based on historic precedent or otherwise established in consultation with the benefitting community.

Freeboard requirements will vary according to the standard of construction and flood behaviour.

For individual (private) levee systems the level of protection, standard of design and construction, and any freeboard requirement is expected to be at the discretion of the landowner.

Addressing the Residual Risk

Unless a levee has been built to protect property from the probable maximum flood it will overtop at some stage. And even if it doesn't overtop there is still a chance that it could fail through some other mechanism such as a piping failure.

If (or when) the levee fails, potentially large numbers of houses could be affected by flooding to significant depths. If the levee breaches the velocity of the water in the vicinity of the breach can also be substantial. Also, areas protected from riverine flooding can still be subject to stormwater flooding as a result of a large thunderstorm dumping rain beyond the capacity of the local drainage system.

To address this issue:

- Councils will be encouraged to undertake investigations into stormwater flooding for areas protected by urban areas and to consider them in planning controls.
- Emergency management plans will need to be informed by an appraisal of all levee systems. Where possible the level of service is to be estimated.

Addressing Liability

ENRC has recommended that the Government give consideration to enacting legislation to provide protection from legal liability for public authorities conducting works on priority levees in good faith, acting reasonably and responsibly in the public interest, and in accordance with standards agreed to under approved schemes.

Current Government policy is that immunity provisions are rarely appropriate, as they remove the legal rights that would otherwise be available to a person who has suffered loss.

Informal maintenance of levee systems

In Victoria there are rural levee systems that protect a number of properties. They are located on a mix of private and Crown land.

It is likely that most of these levee systems will not be formally managed. The government has left it up to the private beneficiaries to establish consortiums or to develop other systems to collectively manage the levees. This will be difficult to do in practice. Over time it is expected that a large number of rural levee systems will

deteriorate. However if arrangements can be found to collectively manage the levees they will not be allowed to increase in height or extend in length.

Conclusion

A combination of a levee management framework, guidelines and legislation changes will help reform levee management in Victoria. A new Floodplain Management Strategy will be a major cornerstone of the reforms and it will provide a strong basis for implementing the ENRC recommendations for flood mitigation infrastructure ina manner agreed to by the Victorian Government.

The framework is based to some degree on pragmatism, but it is firmly centred on the beneficiary contributes principle. Because it clarifies arrangements for managing levees where there were some obvious gaps it will not be acceptable to all parties. However, over time it should lead to a situation where priority levees are being formally maintained by the communities that benefit most from them and other levees are being informally maintained privately or not at all.

It is expected that, over time, many rural levee systems that protect multiple owners will become a legacy of history and will gradually be allowed to weather away. The management framework should remove any expectation that the state or local government or CMAs will be responsible for maintaining them.

Will it work? Only time will tell.

References

Parliament of Victoria 2012a, *Environment and Natural Resources Committee Inquiry into flood mitigation infrastructure in Victoria*, Parliamentary paper No. 169, Victorian Government, Melbourne.

Victorian Government 2012b: *Victorian Government's response to the Victorian Floods Review* – i*mproving flood warning systems implementation plan*, Victorian Government, Melbourne.

Australian Emergency Management Institute (2013), *Managing the floodplain: a guide to best practice in flood risk management in Australia*. Barton, ACT: .Attorney-General's Department, pg. 2, 7 8.

Appendix 1

Table 1 ENRC Recommendations for levees and the Victorian Coalition Government's Response

Recommendation (abbreviated)		Government's Response
1	A revised Victoria Flood Management Strategy should clearly articulate the principles, roles and responsibilities for the ownership, management and ongoing maintenance of Victoria's levees.	Support in principle: • Government supports minor differences in roles and responsibilities • For some time it has been the policy of successive governments that the Catchment Management Authorities should not rate the beneficiaries of levees. In comparison, there is a history of urban levees being formally managed by local councils.
2	The revised Victoria Flood Management Strategy should provide a strategic framework for the management and ongoing maintenance of Victoria's levees.	Support in principle: • An integrated suite of flood management measures is essential for avoiding unacceptable increases in flood risk, not just levees.
3	All priority public levees not currently the subject of approved schemes, will become subject to approved schemes under the *Water Act 1989*.	Support in principle: • Local Government can continue to use provisions under the Local Government Act but it is preferable for the levee to be managed as a water management scheme under the Water Act.
4	Where there are levees that aren't going to be formally maintained, public authorities will inform levee beneficiaries that they will not fund the repair of their levee following a flood event.	Support: • The government will not contribute to the repair of non-priority levees. However it will not be necessary to inform beneficiaries that funding will not be available to repair non-priority levees.
5	Responsible authorities will identify low priority levees for potential removal, and have them removed when funding becomes available.	Support in principle: • Removal should be subject to investigations to justify removal. It may be more cost effective simply to allow non-priority levees to gradually weather away.
6	Streamlined processes to enable access to levees for the purposes of conducting works, including maintenance.	Support in principle: • Negotiate legal access over private and Crown land if it is to be formally maintained.

Recommendation (abbreviated)		Government's Response
		• Make it easier to allow private beneficiaries to enter Crown land to repair levees, but must have regard for the conservation or preservation of historic, indigenous and natural values of the land.
7	Develop guidelines for streamlining the permitting system for conducting works on levees, including exemptions where appropriate.	Support in principle: • Works on existing levees that do not increase the general height or length will still require a permit but should be subject to minimal regulation • Degree of regulation will be commensurate with the risk (low risk = light handed approach).
8	The funding model for works on levees and their ongoing maintenance be revised, to be primarily based on the beneficiary pays principle.	Support: • The "beneficiary contributes" funding model has been outlined in the paper.
9	A regular inspection and maintenance regime will be undertaken for all high priority levees managed by a public authority.	Support: • Include the cost of regular inspections and maintenance into their rates and charges
10	Continue to invest in the auditing of Victoria's levee systems, both public and private, so that the Victoria Flood Database contains reliable and up to date data, including information on levees' location, height, condition and ongoing viability for flood protection.	Support in principle: • Will improve emergency management planning and develop a better understanding of flood behaviour. • Need to prioritise given the cost of audits. • It is unlikely there will ever be sufficient funds to check the height and condition of all private levees.
11	Revise and make available to councils technical guidelines for levee design, construction and maintenance.	Support: • Will update the guidelines by 2014.
12	Review ownership of Grampians Wimmera Mallee Water's Yarriambiack Creek levee..	Support in principle: • Grampians Wimmera Mallee Water continues to own its disused infrastructure. Changes to the management of that infrastructure should be subject to detailed flood studies.
13	Develop flood emergency response plans and identify agreed activities to be undertaken during floods including, where appropriate, the construction of temporary levees. Include the condition of levees.	Support: • Flood sub-plans will be informed by the best available flood mapping and modelling, and will identify agreed activities to be undertaken during floods.
14	Develop guidelines for the management of levees in emergencies, during and after a flood event, which can be incorporated into local flood response plans. Examine a more effective means for councils to remove illegal levees.	Support in principle: • The government will develop a policy to support decision-making by Incident Controllers who may need to breach a levee – or put temporary works in place – where this action might adversely affect individuals even though it is for the overall public good.

Recommendation (abbreviated)		Government's Response
		• The state will assume vicarious liability for the consequences of decisions made by Incident Controllers and Control Agencies during an emergency.
15	Where flood investigations show positive and cost effective outcomes, infrastructure providers, such as VicRoads, will consider enhancing their infrastructure to act as levees.	Support: • CMAs, local councils and the owner of the infrastructure will be encouraged to work together to develop mutually satisfactory solutions to mitigate flood risk.
16	The state government will work with Grampians Wimmera Mallee Water and stakeholders to determine ongoing ownership and associated responsibilities for redundant channel infrastructure in the Wimmera and the Mallee.	Support in principle: • The Victorian Government notes that this is a significant but complex issue involving a number of stakeholders.
17	The Victorian Government should work with the New South Wales Government and the Murray Darling Basin Authority to establish an appropriate floodplain management committee and to develop a floodplain management strategy for the Murray River.	Support in principle: • DEPI will work with its NSW counterparts and the Murray Darling Basin Authority (MDBA) to identify what can be done to ensure that authorities on both sides of the border work cooperatively to manage flood impacts.
18	Implement the recommendations of the Victorian Floods Review in relation to the development and implementation of appropriate flood mitigation and protection strategies for essential services.	Support: • The Victorian Government supports Recommendation 85 of the Victorian Floods Review. This allocates overall responsibility for developing appropriate risk management strategies to the state but also requires the responsible authority or owner/operator of essential services (power, water, telecommunications, etc.) to develop and implement specific strategies.
19	Consider using temporary levees as an alternative or addition to permanent structures. To maximise the use of these structures and limit flood damage, and aid affordability, consider sharing temporary levees among different townships and different council areas.	Support in principle: • Temporary levees should only be used as part of a recognised plan or when authorised by a central authority • The Victorian Government does not support the sharing of temporary levees.
20	Provide protection from legal liability for public authorities conducting works on priority levees in good faith, acting reasonably and responsibly in the public interest, and in accordance with standards agreed to under approved schemes. Public authorities should not be excluded from liability if they have acted negligently.	Support in principle: • Will clarify liability considerations in an re-write of the Victorian Water Act • Must not remove the legal rights available to a person who has suffered loss.