

Keeping Rivers in their Tracts – a Review of the Regulatory Landscape

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Key Points

- Channel migration is a natural process of waterways that brings it into conflict with the built environment.
- A review of planning policy relating to waterway setbacks found that channel migration was rarely a key consideration.
- Examples of the challenges of achieving adequate waterway setbacks for channel migration are given.
- A consequence of inadequate waterway setbacks is an expectation that banks will be armoured to protect assets, often by waterway managers.

Abstract

Planning regulations can enable waterway managers to set conditions on development that can protect waterways from various impacts. Often the greatest tool available to waterway managers as referral authorities is to require a development setback. Not only does this support waterways and riparian vegetation to provide vital ecological functions, it provides a buffer between development and the natural geomorphic processes of a waterway, such as channel adjustment.

A literature review of planning regulations regarding waterway setbacks for development was conducted, covering multiple jurisdictions within Australia. An evaluation of the scientific basis for determining these setback distances was made, with a particular focus on channel migration. Moreover, to appraise the consequence of inadequate setbacks, the obligation for waterway managers to mitigate erosion impacts on assets was explored.

It was found that setback distances are often inadequate, and/or inconsistently applied. Few planning regulations are informed by a current understanding of geomorphic processes and are often unduly influenced by planning precedence. Simultaneously, there is a general perception that waterway managers are obligated to protect property and assets from channel erosion, despite there being any clear legal responsibility to do so.

In the broader community, it is not always well understood that rivers adjust. This needs to be better communicated by waterway practitioners and appreciated by policy makers. Clarifying the responsibility, and subsequent cost, for dealing with the consequences of inadequate setbacks (e.g. erosion) may help for this issue to become better appreciated.

Keywords

Channel migration, waterway corridor setbacks, planning policy, river health, asset management

Introduction

Channel migration is a natural process of waterways, whereby they adjust to disturbances to achieve a dynamic state of equilibrium. This can support aquatic ecosystems by creating diverse geomorphic features (providing habitat) and providing a coarse sediment source into waterways (providing food and habitat) (Florsheim *et. al*, 2008). Unfortunately, this aspect of waterways frequently conflicts with our built environment. This continues to be frequently addressed by attempting to stop channel

migration with the application of bank armouring solutions, however this is expensive whilst also degrading the environmental values of a waterway. While erosion threatening assets is not a new issue confronting waterway managers, it is compounding in many places due to a combination of anthropogenic pressures that may include the following:

- Changes in flow regimes, with more regular high velocity flows: this may be due to river regulation, increasing Directly Connected Imperviousness, a loss of roughness from vegetation removal in the catchment, and more regular natural disasters such as fire and flooding due to climate change.
- The increase of urbanisation from a rising population: in addition to the creation of more housing with greater density to support this population, property is becoming more valuable. This can only exacerbate the conflict between channel movement and the built environment where it occurs.
- Works to apply rock armouring and to straighten channels leading to higher velocity flows: by creating hardened banks and removing meanders, higher velocities are generated, with banks further down in the catchment experiencing greater scour as a result.

Ideally this conflict could be avoided by preventing development from occurring within riparian corridors, where vegetation can stabilise banks through a variety of mechanisms (Abernathy & Rutherford, 1999). Planning policy regularly provides for a setback from waterways; however, it is often difficult to achieve the intent of this regulation. In this paper, a review of the current planning policy relating to waterway setbacks for a number of Australian jurisdictions was conducted. In addition, the challenges of implementing these policies are discussed, illustrated with a number of examples. Finally, the consequences of failing to provide for an adequate setback from the waterway to allow for some channel migration is explored.

Literature review of planning and policy

A key regulatory tool available to prevent development within waterway corridors is the requirement for a setback from the waterway in which no assets or structures may be located. These setbacks can enable a number of beneficial outcomes, including:

- prevention of riparian vegetation and soils from being disturbed, and many ecological functions along with it.
- allowance of space for the riparian zone to be rehabilitated where it has previously been disturbed.
- Reduction of the visual impact of development impacting aesthetics of a waterway corridor
- Provision of a buffer between property and impacts from natural waterway processes, including flooding and erosion.

Nevertheless, setbacks are frequently inadequate, and/or inconsistently applied, particularly in consideration of streambank erosion. In exploration of why this occurs, a literature review examining setback policy across multiple jurisdictions in Australia was conducted. A key focus of this review was to understand whether setback requirements were informed by geomorphic principles.

In the first instance, recommendations of riparian corridor widths appropriate for managing channel migration were sought in the literature. While there were many recommended widths for various ecological functions (such as habitat/wildlife protection, water quality/sediment control, etc.), few width recommendations with transparent methodologies for either a) anticipating channel migration, or b) stream bank stabilisation were found, with the exception of that presented by Abernathy and Rutherford (1999):

$$\text{Minimum riparian width} = 5m + \text{bank height} + \text{establishment allowance}$$

This recommendation emphasizes the necessity for setbacks to have riparian vegetation in good condition (as denoted by the establishment allowance parameter), and for a greater width to be required as banks become higher and therefore less stable. Other recommendations in the literature reviewed had varying widths between 3m (Ontario Ministry Agriculture 1998, in DIPNR, 2004) and 88m (Balmer *et al.* 1982, in Hansen *et al.* 2010), however the methodology behind these numbers was not clear.

In light of this guidance, planning policy was reviewed for a number of jurisdictions across Australia to understand whether setback distances were justified by the current literature. The results of this research is presented in Table 1 below:

Table 1 Synthesis of research into waterway setback policies across a number of Australian jurisdictions

Place	Distance (m)	Principles	Notes
Greater Melbourne	20	1st and 2nd order streams	From top of bank Can be increased for site-specific reasons (e.g. erosive soils). Greenfield development
	30	3rd order streams	
	50	4th and 5th order streams	
Greater Bendigo	30	Minimum setback	From top of bank Greenfield development
	50	Where site-specifics require	
	>50	Where site-specifics require	
	30	Minimum setback	From top of bank Infill development
	>30	Where site-specifics require	
<30	Where site-specifics require		
NSW	10	1st order streams	Localised offsetting possible, and infrastructure can be placed in riparian zone. Critique of these reformed regulations in Ives <i>et al.</i> , 2013.
	20	2nd order streams	
	30	3rd order streams	
	40	4th order streams and greater	
Sunshine Coast	10	All streams in urban zones. 1st and 2nd order streams in non-urban zones	From the high bank. Larger setbacks possible for Ecologically Important Areas.
	25	3rd order streams and above in non-urban zones	
Ipswich City Council	10	1st and 2nd order streams	Defined as a minor waterway. From high bank.
	25	3rd and 4th order streams	Defined as a medium waterway. From high bank.
	50	5th order and higher streams	Defined as a major waterway. From high bank.
Brisbane City Council	15	Local waterway corridor sub-category: not a key tributary of Brisbane River or Moreton Bay	From waterways centreline
	20-30	Brisbane River corridor category - larger setback for lower order streams.	From highest astronomical tide
Logan	Not defined	Overlay map defines waterway corridor and wetland, in addition to erosion prone area (though this is captured within waterway corridor).	A number of riparian zone functions identified with performance outcomes defined to explicitly support them. Unclear what corridor mapping distance/area is based on.

For a number of the jurisdictions, a Strahler order approach is used to determine setback widths. Issues with the use of this approach is highlighted by Ives *et al.* (2013), including that the Strahler system was developed in the 1950's based on the hydraulic characteristics of 'streams in the arid south-west of the United States'; that stream order can often be difficult to determine; and that it is often only loosely related to many of the ecological functions of waterway corridors, including bed and bank stabilisation. Consequently, it could not be said that a Strahler order approach to determining setback distances considers channel migration specifically, though it may inadvertently meet the guidance of Abernathy and Rutherford for supporting bank stabilisation if it protects a large enough, well-vegetated riparian zone.

Across all of the policies reviewed, the following examples provided for a setback to allow for channel migration to occur:

- The Draft Ipswich Plan 2024, in which ‘accepted development’ criteria Performance Outcome 3.3 on maintaining hydrological and geomorphological processes of a waterway or wetland requires “an area either side of the existing low flow channel to allow for natural lateral and longitudinal movement”.
- Melbourne Water Greenfield Development Guidelines and Greater Bendigo Waterway Development Guidelines include a provision for standard setbacks to be increased where soils are considered highly erodible and/or channel migration is predicted to occur in the future.
- Logan Planning Scheme 2015 only allows for development within areas considered to be erosion prone where it is “coastal dependent, temporary, readily relocatable or able-to-be-abandoned”.

Even so, while these policies provide for a setback specifically in response to channel migration, it does not indicate how the size of this area is to be determined. It is also unclear whether this setback is to be well-vegetated with indigenous riparian species - something that would protect property and assets from erosion, given it is a clear requirement for streambank stability (Abernathy and Rutherford, 1999).

There are many difficulties in applying policy that has to be sufficiently vague to capture different site-specific circumstances. Even for those with an understanding of the factors where channel migration is likely to occur at a site, it can be difficult to justify adequate setbacks for this without sufficient backing from policy wording. These difficulties are further explored and demonstrated in the next section.

Implementing setback policy recommendations

There are many factors that make it difficult for waterway managers and other relevant authorities to prescribe waterway setbacks in accordance with best practice principles. These factors will be examined with a number of examples from Melbourne, due to:

1. its status as a large urban centre where development is continuing to rapidly grow;
2. its relatively comprehensive and accessible local policy on waterway setbacks, and;
3. the author’s experience in applying this policy as a referral authority for planning applications adjacent to waterways.

A setback can be applied where a development application has been submitted, then becoming a condition that must be met for the development to be approved. Setbacks relate to the position of structures within one’s property boundary. Unlike an easement or reserve, setbacks do not affect the property title, and therefore do not provide a continuing regulatory lever preventing works occurring within them in future. It also doesn’t provide for banks to be vegetated.

While there is a standard minimum setback for greenfield development in Melbourne (20m from the top of bank), setbacks for infill development have to be more flexible in line with the precedent that has been set. For example, the property shown in Figure 1 below shows how impractical it would be to apply a 20m setback – it would prevent any development of their property. Given there is already a house on the property, it is unlikely that a waterway manager would be successful in getting a 20m setback here.



Figure 1 A property on banks of an urban stream. The contours show that the house is at the top of bank and that there is essentially no setback (Source: Vicplan).

Precedence is often the limiting factor for setbacks in urban areas. Where development has previously been allowed to occur within a waterway corridor, it can be difficult to push back on future developments. In Figure 2 below, we can see how one development with a negligible setback has allowed for a future development with an inadequate setback. Both structures are located at the top of bank and essentially have no setback from the waterway.



Figure 2 Development has been allowed to occur at the top of bank (left), enabling another development to use this precedence and be located with a similarly inadequate setback 10 years later (right). (Source: Google Earth Pro).

One aspect that can support, but also undermine, setbacks from waterways is where a flood overlay exists over the property. In Figure 3, a large block in an urban area is half covered by a Land Subject to Inundation Overlay (LSIO). A 20m setback does not extend very far into the property, nor the LSIO. A larger setback for this development is considered acceptable, primarily due to the presence of the LSIO.



Figure 3 Land Subject to Inundation Overlay is demonstrating that much of this property is subject to flooding, and that despite it being in an urban area, a setback of 20m or more would be easily achievable. (Source: VicPlan)

However, there are allowances for structures to be built in a flood zone, by designing for a structure to have adequate freeboard, safe access during flood events and little impact on flooding in adjacent areas (Melbourne Water, 2010). This can undermine the case for an adequate setback to allow for waterway processes. Unlike flood prone areas, setbacks for waterway corridors are not clearly defined with an overlay, meaning they have to be determined on a site-by-site basis. This opens them up to greater legal scrutiny, particularly if the often-perceived priority risk of flooding has been addressed within the design of a structure. Returning the example presented in Figure 1, the entire property is subject to an LSIO – however if the design is largely able to meet criteria to reduce its offsite impacts, and address risks to its occupants during a flood event, the LSIO does not prevent development occurring within the waterway corridor.

In addition to the examples presented above, factors that can make the application of setbacks to (particularly infill) developments challenging include:

1. Difficulties in proving where the top of bank is, particularly when depending on desktop applications to do so.
2. The current political environment that heavily scrutinises environmental controls where they prevent more housing being built, even where there are regulations in place to support this.
3. A reduced capacity of public authorities due to the greater volume of applications which has increased by approximately 40% since 2020 (Melbourne Water, 2023).
4. A lack of site-specific information and expertise, i.e. an investigation into the fluvial geomorphology at a site may better justify the size of a setback to allow for channel migration, but this kind of specialised information is not easily made available to applicants nor assessors.

Despite the opportunity to provide for a setback in a development application, and the support of regulatory policies, tools and guidelines, it is often challenging to implement setbacks that allow for waterway processes such as channel migration. As a result of this, there can be a conflict between a waterway and the safety and security of adjacent properties, assets, and structures.

Dealing with the consequences

Channel migration is often slow enough to be ignored until it begins to pose a real threat to assets and infrastructure. Ideally this would point to a need for these structures to be relocated further away from the waterway corridor. This can often be considered unacceptable, such as where there is no other space for it to move to, or if the costs of relocation are prohibitively high. This has an unfortunate consequence, where it is perceived that the only solution is to prevent the channel from moving by applying hard engineering solutions such as rock armouring. This irreversibly alters the condition of a waterway, by reducing geomorphic complexity, reducing area available for vegetation on banks, and in turn reducing riparian habitat.

In addition, the question of responsibility is raised – who should be preventing the waterway from moving? Not only could this require a substantial financial investment upfront, but an ongoing burden to own and maintain the works. Within the current Victorian Waterway Management Strategy (DEPI, 2013) it is stated that risks to public infrastructure from waterway processes is primarily the responsibility of the asset's owner. However the exact policy wording is less definite, stating:

Management activities required to manage serious risks to public infrastructure from waterway processes should be negotiated by asset owners, waterway managers and relevant beneficiaries of the public infrastructure.

Where this public asset has little relation to the responsibilities or goals of the waterway manager, there is scope to push back on being primarily accountable for protecting these assets. Yet when it comes to recreational assets such as pedestrian paths, there are other aspects to consider. By failing to adequately address a threat to public safety, a waterway manager may be liable for any incidents that may occur. It might be preferable for these paths to be excluded from riparian zones; though it could be argued that it is important (particularly in urban settings) to enable the public to access and enjoy waterways, thereby fostering a greater sense of connection and ideally custodianship of these environments (Figure 4). Nonetheless, this can result in the perverse outcome of undermining a waterway's health to enable people's enjoyment of it. In this way, waterway managers are not only faced with needing to apply hard engineering solutions to prevent channel migration threatening assets, but they may have to use limited budgets meant for improving the waterway condition to do so.



Figure 4 Paths next to a river are ideal for people to access and enjoy them – but what happens if the river moves? Source: Melbourne Water, 2024

When it comes to private assets, most waterway managers are not funded to provide specific protection from channel migration and are therefore justified in not spending these public funds for

purposes of private benefit. Nevertheless, this is often a point of contention for private asset owners. A particular issue is where their asset may have received approval to be built where it could be threatened by this natural process, ostensibly from the waterway manager. It could be argued that a lack of general awareness about the risk of erosion when locating structures close to the bank of a waterway increases an expectation that it is someone else's responsibility.

Overall, despite the lack of clear delineation of responsibilities for waterway managers to address threats to infrastructure due to channel migration, they are often expected to do so. Coupled with the frequently challenging task of ensuring there is room for waterways to move, this issue frequently burdens waterway managers to spend limit resources to prevent a natural process from occurring.

Conclusion

This paper has examined the effectiveness of waterway setback policy to allow for channel migration so as not to impact on the built environment. A review of this policy across a number of Australian jurisdictions found there was rarely a clear justification for setbacks to be made wide enough specifically to account for future movement of the waterway. Furthermore, there was no clear requirement for setbacks to be vegetated with indigenous riparian species, despite its being necessary to stabilise banks and reduce rates of erosion. In addition to this, setback policy is frequently difficult to implement, particularly in urban settings. Challenges that were encountered when attempting to achieve adequate setbacks included the impracticality of applying setbacks to small urban parcels, the difficulty of pushing back on precedence, and for most areas, the lack of definitive planning controls such as overlays. As a result of a lack of space for banks to be stabilised with an adequately vegetated buffer, bank erosion can often threaten adjacent structures, with many assuming that the responsibility for alleviating this threat lies with the waterway manager.

A way forward with this policy area is to strengthen regulations around waterway corridor setbacks as a matter of public safety, with lessons from floodplain development. A greater awareness within the community of channel migration as a natural phenomenon that cannot be sustainably prevented by government will support understanding of the purpose of waterway setbacks. Potential improvements to planning policy regulations to support this include:

- Being more specific about requirements for setback widths (such as with an overlay), and vegetation condition within them.
- Where this setback width cannot be achieved (such as in built up urban areas), placing more onus on applicants to prove that their development is sustainable in the face of future channel migration, such as through a geomorphic assessment, and commitments to maintain riparian vegetation.
- Clarifying policy positions on the responsibilities to protect assets from erosion and channel movement, and ideally placing it with the asset's owners.

Ultimately, sustaining a riparian zone in good condition to maintain stable banks is cheaper, easier, and safer than installing and maintaining rockwork, however this requires space between the waterway and the built environment, as well as an appreciation of its functions. Setback policy can achieve this, but support is needed for them to be improved upon. By improving community understanding of the purpose of waterway setbacks, waterway managers will be better enabled to implement them.

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