



Attachment 1 to Item 3.1.3.

Flood Recovery Planning Pathway Proposal

Date of meeting: 26 March 2024

Location: Council Chambers

Time: 4:00pm



Flood Recovery Planning Pathway Proposal

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1 Introduction

In the past 12 months Hawkesbury City Council has been working with landowners to assist in recovery efforts for the damage caused to private property as a result of the 2021 and 2022 floods. Through this interaction, Council have identified that work is required to be undertaken on private land and often includes minor stabilisation of riverbanks, vegetation re-establishment and re-instatement of flood protection measures that have been destroyed or damaged.

Since the 2021 flood, property owners have been advised to go through the standard development application process and prepare plans and documents for assessment prior to approval. This advice often results in the property owner having to prepare detailed plans and technical reports to the same level that they would be expected to undertake as if they were proposing to develop their land.

Hawkesbury Council have concerns that this may result in extra financial burden for a community trying to recover from flooding, emotional impacts at a sensitive time where the development process may be overly rigid and lead to time delays for straight forward matters, including where no material is proposed to be imported to the site and the owner wants to stabilise or reinstate what was in place prior to the flood.

A key risk is that if a process for flood recovery appears to be unreasonable in the circumstances, that it may result in property owners ignoring advice provided by Council and seeking their own solutions to carry out works which are often inappropriate and poorly thought through, such as the importation of uncontrolled fill and raising the levels of the land by third parties who then do not take responsibility for the quality of the work.

The main feedback since the 2021 floods that Hawkesbury Council has received over the past 12 months is that the development process to do any works to remediate flood damage is too hard and that the current approach in place does not differentiate between development works and re-instatement works, which could be completed between the 2021 and 2022 flood.

This proposal presents an interim planning approval pathway for riverbank rehabilitation, to be tested in the Hawkesbury LGA for an interim period, that assists the local council to provide a responsive approach to assistance to private landowners where they are seeking to carry out minor works to reinstate flood protection measures, riverbanks or levels of land, which have been directly related to the rapid erosion and damage resulting from the recent flooding. This interim approach and testing would be in place until the Local Land Services fast track process that is in early stages of development is able to commence in approximately 18 months' time.

In summary, this proposal seeks endorsement for the following:

- Exempt Development Pathway for riverbank rehabilitation (Section 4)
- Removal of integrated development requirements for certain riverbank rehabilitation and flood recovery works (Section 5), and
- Landowners consent from Crown Lands NSW for the works outlined in Section 4 and Section 5.

2 Rationale for a streamlined assessment process

More than 200 sites within Hawkesbury Local Government Area (LGA) have been impacted by flooding between 2021 and 2022¹. To reinstate and rehabilitate riverbanks that have faced significant erosion from these major flood events landholders are required to go through extensive development assessment and approvals processes. This development assessment process has potentially significant time and cost burden for both landholders, Council and relevant State agencies.

This proposal therefore seeks to simplify the process for assessment and remove the requirement for development approval in certain circumstances. This will reduce the burden on landholders affected by flooding and minimise simplify the involvement of Hawkesbury City Council and State agencies which would otherwise have to review each individual application for riverbank rehabilitation.

To achieve this, proposed in this report is an exempt development pathway and also the removal of individual integrated referral requirements and designated development requirements for specific types of development applications, which are discussed further in Section 4 and 5.

This proposal has been informed by, and is consistent with, the riverbank rehabilitation recommendations prepared for the Hawkesbury-Nepean Riverbank Task Group in 2021 (Appendix B). This proposal is also importantly limited to works with minimal environmental impact only as described in Appendix B.

¹ Information provided by Hawkesbury City Council 2022

3 Consultation in developing proposal

As part of the preparation of this proposal relevant NSW government agencies have been consulted. This proposal has been amended and additional information provided as a result of the feedback received.

The table below provides a summary of the comments received along with the changes that have been made to this proposal as a result of the consultation.

Consultation Summary

Agency	Comments Summary	Proposal Response
<p>NSW Department of Planning and Environment – Water</p> <p>(Formerly known as Natural Resources Access Regulator (NRAR))</p>	<ul style="list-style-type: none"> NRAR would be able to provide ‘rubber stamp’ approval to riverbank rehabilitation if undertaken in accordance with design principles. Suggest Hawkesbury Council develop a set of design principles that NRAR can review and suggested get assistance from Local Land Services to prepare principles. 	<ul style="list-style-type: none"> Exempt development pathway has been developed in accordance with the design principles contained in Appendix C. Hawkesbury Council will assess all development applications against the design principles outlined in Appendix C. Local Land Services guidelines have been used as the basis for design principles. These have also been reviewed by Development Engineers at Hawkesbury Council. These design principles may also benefit from review by DPE chief engineer.
<p>Crown Lands NSW</p>	<ul style="list-style-type: none"> Additional details regarding location and amount of affected lots is requested. Additional details regarding extent and type of works (hard or soft engineering) should be provided. Time frame for implementation of these projects should be clarified. 	<ul style="list-style-type: none"> A map has been included in Appendix A illustrating location of sites subject to this proposal². More than 200 lots may require riverbank rehabilitation in accordance with this proposal. All development applications will be assessed against and consistent with the design principles outlined in Appendix C. This proposal outlines an interim approach to be tested within the

² Map has been prepared by Hawkesbury City Council.

		<p>Hawkesbury LGA until the Local Land Services fast track process that is in early stages of development begins. All works undertaken in accordance with this proposal are to be commenced within 1 year of this proposal being approved.</p>
<p>Department of Planning and Environment (DPE)</p>	<ul style="list-style-type: none"> • Define types of works. • Identify which on-ground works would fall into each category. • Numerical controls to define different works categories. • Specific controls and SEPPs that will be turned off. • Justify that the proposal will result in minimal environmental impact. 	<ul style="list-style-type: none"> • Only two types of work proposed (exempt and development application) as discussed in Section 4 and 5 of this report. • All development applications will be assessed against and consistent with the design principles outlined in Appendix C. • Clarification on SEPPs to be turned off has been provided in this proposal in Section 4.3 • Section 4.1 and Appendix B provide rationale for why the works are considered to result in minimal environmental impact.
<p>Fisheries</p>	<ul style="list-style-type: none"> • No response currently received 	

4 Exempt Development

4.1 Rationale

Under [Part 2, Division 1, Subdivision 15](#) of the Exempt and Complying Development SEPP a number of works are permitted without consent. However, the works required to be undertaken on sites affected by 2021 and 2022 floods of the Hawkesbury River do not comply with what is currently permitted as exempt development.

Changing exempt development will considerably simplify the information requirements for development for flood recovery works, while still ensuring minimal environmental impact.

Therefore, an exempt development pathway is proposed for sites affected by flooding in 2021/2022. The exempt development requirements proposed are outlined in Section 4.2.

The exempt development works are considered to have minimal environmental impact for the following reasons:

- The Hawkesbury Nepean Riverbank Task Group prepared advice dated May 2021 (Appendix B) that categorised bank treatment methods into four categories. The ‘low’ category identified works that involve only soft/green works – meaning generally vegetation management with no hard engineering practices. The exempt development proposed in Section 4.2 will involve no hard engineering, artificial or hard structures and will only involve earthworks using natural sources. As such the exempt development proposal is considered low environmental impact and consistent with the recommendations in Appendix B.
- The exempt development proposal is largely the same as what is currently permitted as exempt development under Part 2, Division 1, Subdivision 15 of the Exempt and Complying Development Code SEPP for earthworks. The only difference from the current exempt requirements is the requirement for works to be setback from property boundaries. The boundary setback requirements have been removed as part of this proposal because boundary setbacks would not result in optimal environmental outcome for riverbank rehabilitation due to land being more susceptible to erosion if not integrated in with the adjoining riverbank.
- The works will only involve removal of dying, dead and destroyed vegetation as a direct result of flooding and as such the requirements for vegetation removal on mapped land under the Biodiversity Conservation Act 2016 No 63 are onerous where no removal of vegetation is proposed. Removal of requirements under this Act will provide clarity for landowners and Council.

4.2 Exempt Development Proposal Requirements

Specified Development

Earthworks is development specified for this exempt development under this proposal if: it is not carried out, constructed or installed on or in a heritage item or a draft heritage item; and has been

affected by a flood in 2021 or 2022; and the site is identified on the map in Appendix A in the Hawkesbury LGA; and if the work is commenced within 1 year of the approval of this proposal being approved as an interim trial.

Development standards

The standards specified for the development for it to be exempt must:

- a) not redirect the flow of any surface water or ground water or cause sediment to be transported onto an adjoining property, and
 - (i) be separated from any retaining wall or other structural support on the site by at least 2m, measured horizontally, and
 - (ii) be located at least 1m from any registered easement, sewer main or water main, and
 - (iii) have adequate drainage lines connected to the existing stormwater drainage system for the site.
- b) if the fill is imported to the site—be free of building and other demolition waste, and only contain virgin excavated natural material (VENM) as defined in Part 3 of Schedule 1 to the [Protection of the Environment Operations Act 1997](#).
- c) not be fill of more than 100 cubic metres on each lot, and
 - (iv) be accompanied by details of the contractor and person/s responsible for importing material to the land and carrying out works on the land, and
 - (v) be accompanied by details in relation to the source of fill material, quantities imported to the site and certificates validating that the material is suitable for the proposed use and free of contamination, and
 - (vi) be accompanied by a written agreement between the contractor responsible for importing material to the site and the property owners confirming that all works will be carried out in accordance with the requirements of this plan.
- d) not involve the construction of any retaining wall or hard engineering structures.
- e) be stabilised and re-vegetated using native trees and plants upon the completion of any earthworks. Grass alone as vegetation is not permitted where the grade of the bank is more than 1(v):3(h).
- f) be constructed in accordance with the relevant consent authority's policy and specifications on soil erosion and sediment control works.
- g) not be located in a mapped coastal wetland or littoral rainforest area.
- h) not involve removal or re-alignment of fallen trees outside of the property boundaries.
- i) Where involving vegetation removal within the property boundaries this is to involve only removal of fallen or dead trees.
- j) not include any enhancements and/or expansion to the embankment beyond its condition immediately before the flood occurred.
- k) not involve removal of vegetation on land mapped on the Biodiversity Values Map prescribed by Part 7 of the Biodiversity Conservation Act 2016.

4.3 SEPPs/Legislation to be turned off for Exempt Development

To permit the above works as exempt development, this proposal seeks DPEs approval to remove, for an interim period (i.e. for works commencing within one year from the date of approval for this proposal) the requirements under the clauses outlined in the table below. This will allow exempt

works to be undertaken for riverbank rehabilitation within Hawkesbury LGA to facilitate flood recovery.

SEPP Clauses to be turned off for exempt development

SEPP (Biodiversity and Conservation 2021)	
Clause Number and Name	Clause Description
9.9 Development controls	<p>(4) Remediation of contaminated land</p> <p>Definition: Removing soil or other deposits from, or otherwise remediating, contaminated land. For the purposes of this definition, contaminated land means land on which hazardous substances occur at concentration levels above background levels, where an assessment (carried out in accordance with guidelines circulated to councils by the Department) has indicated the substances pose, or are likely to pose, an immediate or long-term hazard to human health or to the environment.</p> <p>Consent required.</p>
	<p>(7) Filling</p> <p>Definition: Filling of land, including submerged aquatic land, by raising the ground level through disposal of spoil from any landfill method (such as mining, dredging or refuse dumping), whether or not to enable the construction of a road or the erection of buildings or pylons or any other structure, where filling exceeds 1 metre in depth, or an area of 100 square metres.</p> <p>Consent required.</p>
	<p>(16) Land uses in riverine scenic areas</p> <p>Definition: The following in scenic areas of the riverine corridor shown on the map as being of significance beyond the region (which are also scenic areas of significance for the region) or so shown as being of regional significance only—</p> <p>(a) subdivision,</p>

	<p>(b) clearing, (c) erection of a structure greater than 50 sq m in area or over 1 storey in height, (d) carrying out of works for the purpose of stabilising the riverbank.</p> <p>Consent required.</p> <p>Additional matters for consideration by the consent authority:</p> <p>(a) The need to prevent large scale, high density or visually intrusive development on waterfront land or on slopes and ridgetops which are visible from the river or the surrounding visual catchment. (This requires consideration of the proposed form and siting of buildings, of the colours and building materials used, and of landscaping.) (b) Whether the materials used in stabilising the banks are consistent with the scenic character of the area as described in the Scenic Quality Study. (c) Whether the development will damage the banks of the river or creeks. (d) Whether the development is adequately set back from the river. (e) Whether it is necessary and appropriate to increase public recreational and visual access to the river. (f) The need for conditions of consent to protect the scenic character, such as conditions requiring tree planting. (g) Whether any proposed works will improve scenic quality by repairing degradation.</p>
<p>Biodiversity Conservation Act 2016 No 63</p>	
<p>Section 7.2 Development or activity “likely to significantly affect threatened species”</p>	<p>(1) For the purposes of this Part, development or an activity is <i>likely to significantly affect threatened species</i> if—</p> <p>(a) it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in section 7.3, or</p> <p>(b) the development exceeds the biodiversity offsets scheme threshold if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or</p> <p>(c) it is carried out in a declared area of outstanding biodiversity value.</p>

5 Development application/Integrated development amendments'

5.1 Rationale

Under Division 4.8 of the Environmental Planning & Assessment Act 1979, Integrated Development is development (not being State Significant Development or Complying Development) that, in order for it to be carried out, requires development consent and an approval under another Act outside of the development application process.

This proposal seeks to remove, on an interim time limited basis for flood recovery, the requirement for individual integrated development referrals outlined, subject to the relevant state agencies providing written agreement, and identifying their conditions for development to proceed.

This simplification is important to complement the exempt pathway by a development assessment pathway that can be managed internally and fast-tracked by Hawkesbury City Council.

Consultation has been undertaken with the relevant state agencies, as outlined in Section 3, and the proposal has been amended to respond to concerns raised by these state agencies. This initial consultation will be complemented by formal letters to be sent to from Hawkesbury City Council to relevant agencies seeking written confirmation of support for the proposed arrangements. Appendix D provides a copy of the letter to be distributed to the relevant state agencies seeking their formal agreement.

5.2 Development Application Requirements

This proposal seeks to remove individual integrated referral requirements under the relevant state legislation, outlined in the table in section 5.3 below and designated development requirements for works outlined in the table in section 5.3 for any development applications that meet the following criteria and design principles contained in Appendix C. These are where:

- a) the site has been impacted by flooding in either 2021 or 2022
- b) works are to involve riverbank rehabilitation and vegetation establishment in accordance with the design principles outlined in Appendix C
- c) all hard engineering proposed is in accordance with Appendix C
- d) no changes to physical structures on the site are permitted, and
- e) vegetation establishment of natives (other than grass) must be proposed.

It is recommended that DPE Chief Engineer also review and confirm the design principles provided in Appendix C.

5.3 Integrated Development Requirements to be removed

The integrated development requirements outlined in the table in section 5.3 below are proposed to be removed for any development applications that fall into the description in Section 5.2.

5 Integrated development requirements to be turned off

Section	Description
Division 4.8 EP&A Act Integrated development	
<p>Water Management Act 2000 Section 91</p>	<p>(1) There are two kinds of activity approvals, namely, controlled activity approvals and aquifer interference approvals.</p> <p>(2) A controlled activity approval confers a right on its holder to carry out a specified controlled activity at a specified location in, on or under waterfront land.</p> <p>(3) An aquifer interference approval confers a right on its holder to carry out one or more specified aquifer interference activities at a specified location, or in a specified area, in the course of carrying out specified activities.</p>
<p>Fisheries Management Act 1994 219 Passage of fish not to be blocked</p>	<p>(1) A person who—</p> <ul style="list-style-type: none"> (a) sets a net, netting or other material, or (b) constructs or alters a dam, floodgate, causeway or weir, or (c) otherwise creates an obstruction, across or within a bay, inlet, river or creek, or across or around a flat, so that— (d) fish will or could be blocked or left stranded, or (e) immature fish will or could be destroyed, or (f) the free passage of fish will or could be obstructed, <p>is guilty of an offence.</p> <p>Maximum penalty—In the case of a corporation, 2,000 penalty units or, in any other case, 1,000 penalty units.</p> <p>(2) A court convicting a person of an offence under this section may order the person to remove, within a specified period, the obstruction involved in the commission of the offence.</p> <p>(3) If such an order is not complied with within the specified period, the Minister—</p> <ul style="list-style-type: none"> (a) may cause the obstruction concerned to be removed, and (b) may, by proceedings brought in a court of competent jurisdiction, recover the cost of removal as a debt from the person against whom the order was made. <p>(4) An order made by a court under section 10 of the Crimes (Sentencing Procedure) Act 1999 in any proceedings for an offence under this section is taken, for the purposes of this section, to be a conviction for the offence.</p> <p>(5) This section does not apply to or in respect of the following—</p> <ul style="list-style-type: none"> (a) any activity that is otherwise permitted by or under this Act or any other Act,

	<p>(b) any activity that is done in accordance with a permit issued by the Minister under this Part,</p> <p>(c) any activity or waters of a kind exempted from the operation of this section by the regulations.</p>
<p>National Parks and Wildlife Act 1974</p> <p>90 Aboriginal heritage impact permits</p>	<p>(1) The DPC Secretary may issue an Aboriginal heritage impact permit.</p> <p>(2) An Aboriginal heritage impact permit may be issued subject to conditions or unconditionally. However, a condition cannot be imposed on a permit if compliance with the condition would result in a breach of a requirement made by or under this Act.</p> <p>(3) An Aboriginal heritage impact permit may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.</p>

5.4 Other Clauses to be turned off for development applications

The designated development requirements and biodiversity requirements outlined in the table in section 5.4 below are proposed to be removed for any development applications that fall into the description in Section 5.2

5SEPP Clauses to be turned off for development applications

SEPP Resilience and Hazards (2021)	
Clause Number and Name	Clause Description
<p>2.7 Development on certain land within coastal wetlands and littoral rainforests area</p>	<p>(2) Development for which consent is required by subsection (1), other than development for the purpose of environmental protection works, is declared to be designated development for the purposes of the Act.</p>
Biodiversity Conservation Act 2016 No 63	
<p>Section 7.2 Development or activity “likely to significantly affect threatened species”</p>	<p>(1) For the purposes of this Part, development or an activity is <i>likely to significantly affect threatened species</i> if—</p> <p>(a) it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in section 7.3, or</p> <p>(b) the development exceeds the biodiversity offsets scheme threshold if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or</p>

	(c) it is carried out in a declared area of outstanding biodiversity value.
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6 Landowner's Consent

6.1 Rationale

Consent from Crown Lands NSW is required for both components of this proposal because often works are located below the mean high-water mark on the toe of the riverbank, which is located on Crown Land. This proposal seeks to provide a number of options that will provide flexibility for landowners and Hawkesbury City Council where restoration works are proposed following a flood event but to simplify the landholder approval process from Crown Lands. It is proposed that this will not require Crown Lands consent prior to lodgement of an application and for each individual application.

Landowners consent from Crown Land NSW is sought for the works outlined in Section 4 and Section 5 on a group basis. This will mean that individual private landholder's wont need to get consent from Crown Lands when they are located on a site identified in Appendix A. This will reduce time impacts for landholders and reduce resource and administration requirements for Crown Lands NSW who will not have to provide individual owners consent for each property due to large number of sites requiring riverbank rehabilitation. This will allow Hawkesbury City Council to be the one stop shop for the application and have endorsement from crown lands to proceed with assessing applications as part of flood recovery.

Crown Lands NSW has been consulted and have requested additional information to be provided regarding the location, number of sites that would form part of this proposal and design criteria/principles. This information has been included in this proposal.

6.2 Requirements for landowner's consent

Landowners consent is sought for:

- Any works on Crown Land, undertaken as exempt development, for properties nominated in the map on Appendix A.
- Any development applications submitted to Hawkesbury City Council that have development that is consistent with the design principles in Appendix C (Section 5).

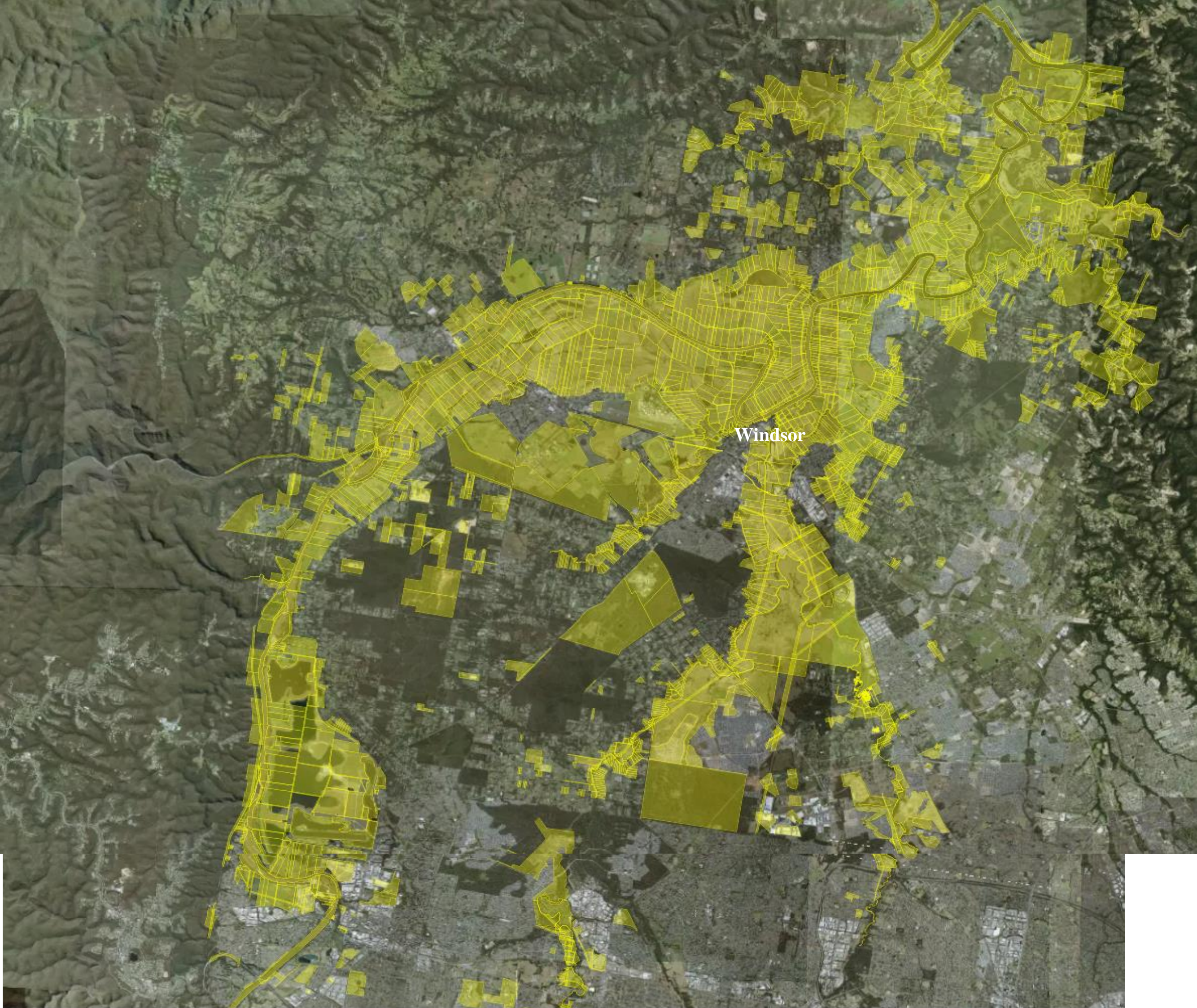
Hawkesbury Council will notify Crown Lands when an approval has been granted for the development pathway for works on Crown Land, including details of works as executed for Crown lands records.

7 Recommendations

In summary, this proposal recommends that the following is adopted to simplify and streamline the approvals process for flood recovery in the Hawkesbury LGA.:

- Establish an Exempt Development Pathway for riverbank rehabilitation within Hawkesbury City Council LGA for an interim period, as outlined in Section 4.
- Remove individual integrated development requirements and build in flexibility when assessing development applications for certain riverbank rehabilitation and flood recovery works within Hawkesbury LGA for an interim period, where consistent with agreement with relevant State agencies, as outlined in Section 5.
- Provide group landowner's consent from Crown Lands NSW for the works on Crown lands for riverbank rehabilitation, as outlined in Section 4 and Section 5.
- Establish a trial of recovery planning approach in the Hawkesbury LGA, for commencement of works or development within 1 year of approval of this proposal. This will be an interim arrangement until the fast-track approval process is developed state-wide by LSS and will also provide a trial of this approach to inform the fast-tracking process development.

Appendix A



Subject Site



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Appendix B

Post-flood Erosion Mitigation Works

General Advice

Prepared May 2021

Background

Heavy rainfall from 19-23 March 2021 caused extensive flooding along the NSW coast from Grafton south to Sydney and inland to Moree. Storms and flooding impacted homes and properties within 8 Local Government Areas in the Hawkesbury Nepean Catchment. Erosion and storm damage was observed throughout the region with extensive cleanup and recovery efforts required throughout the catchment.

This document aims to provide land managers with basic best practice advice when assessing the suitability of proposed erosion mitigation works, undertaking on-ground inspections or liaising with landholders in the context of post-flood recovery.

It also looks to provide a list of up to date guidelines and resources for further detail on best practice river and waterway management. This document should only be utilised in post-flood recovery context and does not replace the need for environmental approvals, technical/specialist input or site-specific designs.

General Considerations

Riverbank erosion is a natural process that can be expected during flood events, such as that experienced on the Hawkesbury-Nepean River in March 2021. In particular, bank erosion is expected to occur on the outside bend (concave bank) of a meandering river as a natural process of lateral river movement. However, if the rate, location or mode of bank erosion does not align with that expected from natural processes then it can be the result of human disturbance at the site or in the catchment.

It is essential not to 'eliminate' erosion, as it is important for river function, however where erosion results in immediate or short-term threat to life and/or assets an appropriate mitigation method can be implemented following industry best-practice. Most areas of erosion typically caused by scour, slumping and rotational failure, will eventually become stable by gradually battering themselves back to a more stable angle. All areas of riverbank should be considered for stock exclusion and riparian revegetation to promote long-term stability.

Likewise, deposition of river sediment is a natural process and is expected to occur in areas of lower flow velocities such as the inside bend (convex bank) of rivers and as flood waters recede. River sediment should not be removed as it is essential to river function and can provide protection to areas in future floods.

Post-flood Erosion Mitigation Works

A rapid desktop assessment of 231 identified erosion sites in the Hawkesbury-Nepean Catchment was undertaken to categorise sites by priority for works or inspection. The intention of this rapid assessment was to identify erosion hotspots and assist land managers in assessing the suitability of proposed erosion mitigation works, undertaking on-ground inspections or liaising with landholders in the context of post-flood recovery. The protection of property, built assets and environmentally sensitive sites was the dominant variable of this assessment.

Erosion Sites were categorised as Low, Medium, High or Very High priority for works or inspection (see Rapid Desktop Assessment Methodology).

Hydrosphere Consulting, 2020 categorised bank treatment methods into three categories for the development of the *Decision Support Tool for Bank Erosion Management in NSW Estuaries*. The three categories and examples of works are outlined in Figure 1.


<p>Higher Environmental Benefit</p>  <p>Lower Environmental Benefit</p>	Soft/green (Section 6)	Riparian vegetation management	Typically dominated by vegetation or natural materials (when considering complementary techniques). Vegetation is typically the dominant element in these approaches and is often supported by natural or biodegrading unobtrusive elements such as coir logs, brush bundles, brush matting etc.) to facilitate vegetation growth.
		Fencing	These methods perform natural processes to provide bank stabilisation. Over time, sites using soft/green methods return to a natural state with no artificial or hard structures present.
	Hybrid (Section 7)	Oyster reefs (emerging technique, refer Section 9.1)	These methods use an engineered or built structure to provide bank protection and a biological feature to provide long-term stabilisation.
		Large woody debris	In the long term, hybrid techniques mature to a mostly natural form and function with a site developing into a predominantly natural state.
		Rock fillets	
	Hard/grey (Section 8)	Renourishment	Engineered structures using hard, synthetic and/or imported materials, such as rock, that harden a bank. These methods are typically armouring type solutions that aim to physically protect a bank from erosion forces. Although renourishment also fits the definition for 'soft' treatments it is considered more appropriate that they are categorised as under "Hard/grey methods" in this report, consistent with its associated level environmental benefit.
		Cobble beaches	
		Bed control structures	
		Groynes	
		Timber wall	
Sand sausage (innovative technique, refer Section 9.2)			
Geotextile Sand Containers			
Rock revetment			
Concrete wall			

Figure 1: Categorisation of bank treatment methods and examples (Hydrosphere Consulting, 2020)

Table 1 suggests the most suitable approach for the identified erosion sites to assist land managers in making decisions about erosion mitigation works in the Hawkesbury-Nepean Catchment.

Table 1: Recommended approach by assessment category

Category	Recommended Approach
Low	Soft/Green - Natural Recovery
Medium	Soft/Green/Hybrid
High	Hybrid
Very High	Specialist assessment required – potential for Hard/Grey or planning solution. Temporary emergency works may be required.

When determining the appropriate approach, the following should be considered:

- Are works required? Will the works have long-term implications e.g. cause erosion upstream or downstream?
- The best approach at a given site may incorporate elements of both hard and soft techniques
- Soft approach is always preferred with minimal use of ‘hard’ elements
- Where erosion poses a serious risk to public safety or public infrastructure, temporary emergency works may be required while long-term solutions are developed in accordance with the relevant legislation.

See *Development and Validation of a Decision Support Tool for Bank Erosion Management in NSW Estuaries - Best Management Practice Estuary Bank Treatment Methods* for examples of treatment options, best practice and example costing.

Key Considerations

Key considerations for assessing proposed works or undertaking works on-ground after a flood event are outlined below:

Bank Stabilisation Works

Recommended

- All soil, fill, gravel, sand and rock used for stabilisation works should be certified VENM (virgin excavated natural material).
- **Professional engineering and/or geomorphic advice should be sought before attempting to implement engineered stabilisation works.**
- **Consider both natural recovery potential of unstable banks and/or relocation of the threatened asset. The cost of and timeframe required to prepare engineered designs, secure available funding and undertake works may warrant consideration of the relocation or decommission of asset under threat.**

Not Recommended

- Using unnatural materials such as concrete mattresses, sheet piling, block revetment and gabions or rock mattresses due to their incompatibility with the ecological aspects of waterway environments.
- Hard vertical structures (e.g. sheet piling, block or log revetment) should be avoided as these will reflect waves and may adversely impact on opposite or adjacent banks and/or recreational boating activities.
- Waste and/or contaminated material should never be used for fill or armour river banks, including tyres or concrete rubble or blocks.
- Undertaking works without consultation including removal or re-alignment of fallen trees.

Bank Reshaping

Recommended

- Berms (Figure 3.3) may need to be introduced to steep banks that are higher than 3 metres, or where erosion is expected along the toe of the bank. A typical berm width is one metre wide.
- Establishing a berm on a watercourse bank can provide the following benefits:
 - If bank erosion occurs at the toe of the bank and this erosion results in soil slumping on the bank, then the berm can reduce the area of the bank over which this slumping occurs.
 - Bank berms can be used to increase the stability of steep banks.
 - Berms can be used to delay the effects of soil erosion around the root system of establishing trees.
- If bank reshaping works are required, a bank slope of 1(V):2(H) is recommended.

Not Recommended

- Avoid a regularly 'trapezoidal' channel shape down the reach and introduce a variation of bank slopes to replicate a natural watercourse.
- Steep banks on the outside bend they as are highly unstable and difficult to stabilise with vegetation.
- Grassed bank grades of 4(H):1(V) and steeper are not recommended adjacent to a watercourse where:
 - public access exists;
 - the watercourse is considered a safety hazard during dry weather conditions or during regular flood events (up to the 5 year ARI); and
 - satisfactory safety barriers such as fences, shrubs, bushland or flat landings do not exist between the embankment and floodway.

Vegetation Management

- If riparian land is not well-vegetated with deep-rooted plants, bank erosion can accelerate. Eroded surfaces should be replanted with deep-rooted native species to help stabilise riverbanks and protect them in times of flood. Well-vegetated waterway banks are also more resistant to under-cutting and slumping. Planting exotic species should be discouraged.
- The establishment of a compositionally well-structured vegetated riparian zone of an appropriate width, including fencing and stock management, is critical for the long term viability of all bank stabilisation options. Riparian vegetation augments river bank stability in three ways:
 - The roots of the vegetation help reinforce the soils.
 - Vegetation slows flow, reducing the erosive forces on the river bank.
 - Vegetation cover armours the underlying soil from the wave and flow erosion processes.
- Removal of native instream vegetation from waterways is generally not recommended as it is detrimental to waterway health.
- **Large wood (LW) or native vegetation should not be removed from waterway channels unless it poses a serious risk to public safety or public infrastructure, e.g. large wood abutting bridges and other infrastructure after floods.**
- **Professional geomorphic advice should be sought before removing or realigning LW.**
- Trimming, realigning or anchoring LW should be explored before considering removal (see *Assessment of flood risk posed by vegetation and large wood in and around waterways* DELWP, 2018)
- Riparian land is prone to weeds spread by water and from stock access. Following flood events, exposed surfaces are vulnerable to weed infestation. Weed management activities should be prioritised and accompanied by revegetation works.

Working in Waterways

Waterways are sensitive environments. Some basic mitigation measures for working in waterways are provided below:

- Refuelling or maintenance of vehicles or machinery should occur within an impervious bunded area more than 50 m from the river or any drainage line to prevent the escape of spilled substances to the surrounding environment. Vehicles and machinery should be regularly maintained and checked for leaks.
- Appropriate spill kits, contamination booms and/or absorption materials (as required) should be kept on site and emergency procedures adopted in the event of a spillage/leak. Pollution incidents that cause or may cause potential harm to the environment must be reported to the NSW EPA.

- It is recommended erosion and sediment controls should be in place prior to works commencing. It is essential that downstream environments are protected from excess and ongoing sedimentation, particularly after a major flood event.
- Due diligence should be completed for all sites and include consideration of aboriginal heritage, non-aboriginal heritage and threatened species or ecological communities.
- All necessary authorities and landholders must be consulted prior to works commencing and any required permits obtained (see below).
- Minimise construction footprint and proposed extent of disturbance to soil and vegetation within the watercourse or waterfront land.

Policy and Permits

Due diligence is important when undertaking rivers works as environmentally sensitive sites are often located within riparian corridors. Key considerations are outlined below, however a site specific investigation of the relevant legislation should be undertaken.

Heritage

- All Aboriginal sites in NSW are protected under the *National Parks and Wildlife Act 1974*, and it is an offence to damage or destroy them without prior permission of the NSW Government. The penalties for harming an Aboriginal site (which could include graffiti) are up to \$275,000 and one year's imprisonment for individuals and \$1.1 million for corporations.
- If someone is planning an activity that may disturb the ground or old growth trees, they must show that they have taken steps to avoid damaging or harming any Aboriginal site. A review of potential Aboriginal heritage issues (whether at desktop level or up to a full archaeological survey) will ensure Aboriginal sites are not accidentally damaged and the people doing the work (individuals and 'corporations') are not liable for prosecution.
- In the event items of ACH are uncovered during the work, all work in the vicinity of the find must cease and DPIE notified. Advice and appropriate procedures from DPIE for such instances will be implemented. In the unlikely event European cultural relics are uncovered during the course of the work, all work in the vicinity of the find must cease and NSW Heritage informed, and appropriate procedures implemented.

Fisheries Management Act 1994

- Part 7, Division 4 of the *Fisheries Management Act 1994* specifies that '*A person must not harm any such marine vegetation in a protected area, except under the authority of a permit issued by the Minister under this Part*'. Marine vegetation includes mangroves, seagrasses or any other marine vegetation declared by the regulations to be marine vegetation.
- Part 7, Division 3 of the *Fisheries Management Act 1994* specifies that '*A person must not carry out dredging work or reclamation work except under the authority of a permit issued by the Minister.*'

- Dredging work includes:
 - any work that involves excavating water land, or
 - any work that involves moving material on water land or removing material from water land that is prescribed by the regulations as being dredging work to which this Division applies.
 - Reclamation work includes:
 - using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land, or
 - depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or
 - draining water from water land for the purpose of its reclamation.

Water Management Act 2000

- If works are undertaken by or on behalf of a Public Authority works are exempt from obtaining a Controlled Activities Approval. Best practice must still be applied.

Coastal Management Act 2016

- Under the *Coastal Management Act 2016* and *State Environmental Planning Policy (Coastal Management) 2018* (SEPP). Development Approval from Council is required for a private land owner to undertake riverbank protection works adjacent to tidal waters. Under the SEPP, Council can only grant development approval if the applicant can demonstrate that there is no increase in the risk of riverbank erosion adjacent to the works.

Vegetation

- If proposal involves damaging threatened species of flora or fauna or habitat under the *Biodiversity Conservation Act 2016*, you must consult with NSW National Parks and Wildlife Service (Threatened Species Unit). Endangered Ecological Communities can include Swamp Oak, Freshwater Wetlands, Swamp Sclerophyll, Coastal Saltmarsh, River Flat Eucalypt, Sub Tropical Eucalypt, and Littoral Rainforest.

Landownership

- Most beds and banks of waterways are **Crown land**. Consent is required to carry out works or activities on Crown land.
- The **doctrine of accretion and erosion** may apply to boundaries in the Hawkesbury-Nepean Catchment following the March 2021 Floods.

Recommended Resources

Stock management near waterways

[Stock and Waterways: A NSW Manager's Guide](#)

[River Landscapes – Chapter 9 Impacts of land management practices on riparian land](#)

Guidelines for riparian fencing in flood prone areas

[Factsheet](#)

[Guidelines report](#)

Riparian vegetation and stream erosion

[Impact of riparian revegetation on stream erosion](#)

[Flood risk from vegetation and large wood in waterways](#)

[Erosion Type Fact Sheet](#)

Natural Resources Access Regulator

[Guidelines for controlled activities on waterfront land](#)

Best Practice Treatment Methods and Decision Support

[Development and Validation of a Decision Support Tool for Bank Erosion Management in NSW Estuaries - Best Management Practice Estuary Bank Treatment Methods](#)

Natural Channel Design

[Brisbane City Council Natural Channel Design Technical Documents](#)

Appendix C

Design Principles

When determining the development application, the following should be considered:

- Are works required? Will the works have long-term implications e.g., cause erosion upstream or downstream?
- The best approach at a given site may incorporate elements of both hard and soft techniques
- Soft approach is always preferred with minimal use of 'hard' elements
- Where erosion poses a serious risk to public safety or public infrastructure, temporary emergency works may be required while long-term solutions are developed in accordance with the relevant legislation.
- Is the development consistent with Design Criteria contained in Table 1.1.

1.1 Design Principles for Development Applications on sites affected by floods in 2021/2022

Type of Work	Design Criteria to be met
Bank Stabilisation Works	<ol style="list-style-type: none"> 1. All soil, fill, gravel, sand and rock used for stabilisation works should be certified VENM (virgin excavated natural material) and ENM (Excavated Natural Material). 2. Professional engineering and/or geomorphic advice should be sought before attempting to implement engineered stabilisation works. 3. Consider both natural recovery potential of unstable banks and/or relocation of the threatened asset. The cost of and timeframe required to prepare engineered designs, secure available funding and undertake works may warrant consideration of the relocation or decommission of asset under threat. 4. Bank toe protection works are required to identify the location of property boundaries and confirmed by a registered surveyor 5. Not include enhancements and expansion to the embankment beyond its condition immediately before the flood occurred Any structural works must be structurally engineered.
Bank Reshaping	<ol style="list-style-type: none"> 6. Berms may need to be introduced to steep banks that are higher than 3 metres, or where erosion is expected along the toe of the bank. A typical berm width is one metre wide. 7. Establishing a berm on a watercourse bank can provide the following benefits: <ol style="list-style-type: none"> (i) If bank erosion occurs at the toe of the bank and this erosion results in soil slumping on the bank, then the berm can reduce the area of the bank over which this slumping occurs. (ii) Bank berms can be used to increase the stability of steep banks.

	<p>(iii) Berms can be used to delay the effects of soil erosion around the root system of establishing trees.</p> <p>8. If bank reshaping works are required, a bank slope of 1(V):2(H) is recommended.</p>
<p>Vegetation Management</p>	<p>9. If riparian land is not well-vegetated with deep-rooted plants, bank erosion can accelerate. Eroded surfaces should be replanted with deep-rooted native species to help stabilise riverbanks and protect them in times of flood. Well-vegetated waterway banks are also more resistant to under-cutting and slumping. Planting exotic species should be discouraged.</p> <p>10. The establishment of a compositionally well-structured vegetated riparian zone of an appropriate width, including fencing and stock management, is critical for the long-term viability of all bank stabilisation options. Riparian vegetation augments riverbank stability in three ways:</p> <ul style="list-style-type: none"> (i) The roots of the vegetation help reinforce the soils. (ii) Vegetation slows flow, reducing the erosive forces on the riverbank. (iii) Vegetation cover armours the underlying soil from the wave and flow erosion processes. <p>11. Removal of native instream vegetation from waterways is generally not recommended as it is detrimental to waterway health.</p> <p>12. Large wood (LW) or native vegetation should not be removed from waterway channels unless it poses a serious risk to public safety or public infrastructure, e.g. large wood abutting bridges and other infrastructure after floods.</p> <p>13. Professional geomorphic advice should be sought before removing or realigning LW.</p> <p>14. Trimming, realigning or anchoring LW should be explored before considering removal (see <i>Assessment of flood risk posed by vegetation and large wood in and around waterways</i> DELWP, 2018)</p> <p>15. Riparian land is prone to weeds spread by water and from stock access. Following flood events, exposed surfaces are vulnerable to weed infestation. Weed management activities should be prioritised and accompanied by revegetation works.</p>

Working in Waterways

16. Refuelling or maintenance of vehicles or machinery should occur within an impervious bunded area more than 50 m from the river or any drainage line to prevent the escape of spilled substances to the surrounding environment. Vehicles and machinery should be regularly maintained and checked for leaks.
 17. Appropriate spill kits, contamination booms and/or absorption materials (as required) should be kept on site and emergency procedures adopted in the event of a spillage/leak. Pollution incidents that cause or may cause potential harm to the environment must be reported to the NSW EPA.
 18. It is recommended erosion and sediment controls should be in place prior to works commencing. It is essential that downstream environments are protected from excess and ongoing sedimentation, particularly after a major flood event.
 19. Due diligence should be completed for all sites and include consideration of aboriginal heritage, non-aboriginal heritage and threatened species or ecological communities.
 20. All necessary authorities and landholders must be consulted prior to works commencing and any required permits obtained (see below).
 21. Minimise construction footprint and proposed extent of disturbance to soil and vegetation within the watercourse or waterfront land.
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Appendix D