

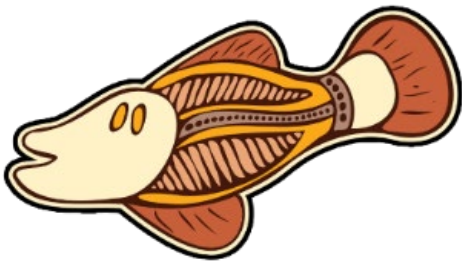
Background to the Floodplain Management Plan for the NSW Murray Valley Floodplain 2026

Background document

1 July 2026



Acknowledgement of Country



Department of Climate Change, Energy, the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

Wiradjuri artist and designer Nathan Peckham from Yurana Creative created Guwunggan*.

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Background to the Floodplain Management Plan for the NSW Murray Valley Floodplain 2026

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1 Introduction

The Water Group in the NSW Department of Climate Change, Energy, the Environment and Water (the department) is continuing to reform the management of water on the floodplains of inland NSW. Floodplain management plans provide the framework for coordinating the development of flood works on a whole-of-valley basis.

This document provides background to the development of the rules in the Floodplain management plan for the NSW Murray Valley Floodplain 2026 (the FMP) and includes:

- the purpose of statutory floodplain management plans
- the process of plan development including scope, history and basis for decisions
- the activities associated with implementation, monitoring and review of the FMP.

The FMP is a Minister's plan under section 50 of the *Water Management Act 2000* (WM Act). It will last for 10 years from 1 July 2026 and can be amended at any time if errors are identified and/or it is in the public's best interest.

During the 10-year term, the FMP will be audited by the [Natural Resources Commission](#) within the first 5 years and reviewed by the department within the last 5 years. At the end of the 10-year term, it will be replaced with another FMP that will last for 10 years.

This document is part of a range of information available specifically on the FMP including:

- the *Floodplain management plan for the NSW Murray Valley Floodplain 2026* — a legal instrument written in its required statutory format as published on the [NSW Legislation website](#)
- rule summary sheet — a fact sheet summarising the rules for flood works in each management zone in the FMP published on the [department's website](#)
- plan maps — A0 pdf versions of the maps that are listed in the plan and published on the [department's website](#)
- [interactive spatial map](#) — an online mapping tool to view the floodplain boundary, management zones and identified ecological assets on the floodplain. You can also find the floodplain management plan spatial dataset on the NSW Government's [SEED portal](#) for use in your own geographic information system.

More information about how floodplain management plans work and the planning process is available on the [department's website](#).

1.1 Why are floodplain management plans being prepared?

Floodplain management plans (FMPs) are made under the WM Act and provide the framework for coordinating flood work development to:

- minimise future changes to flooding behaviour
- improve the environmental health of floodplains
- increase awareness of risk to life and property from the effects of flooding.

FMPs establish management zones and rules which provide clarity about where flood works may be constructed on the floodplain and to streamline the approval process for new and amended flood works.

Flood works are structures that alter the flow of water to/from a river or alter the movement of floodwater during a flood. Flood works are built on rural floodplains to enhance the agricultural productivity of land used for grazing, dryland cropping and irrigated cropping. Examples of flood works include levees, earthworks, banks and channels that are constructed to protect crops, stock and properties from flooding; to provide on-farm access; and to manage irrigation, stock and domestic water.

In NSW, all flood works require a flood work approval. Some activities considered low-risk or covered by other legislation may be exempt from approval. Please see the [exemptions to flood work approvals fact sheet](#) on WaterNSW's website for more information.

WaterNSW are responsible for assessing flood work approval applications. To find out more about the flood work approval processes undertaken by WaterNSW, please see the [flood work approvals page](#) on their website.

The FMPs being developed across southern inland NSW consolidate and update historical floodplain management arrangements to:

- meet the requirements of the WM Act
- establish consistent rules for flood works across the floodplain
- improve the coordinated regulation of flood works across the floodplains of the Murray–Darling Basin.

Floodplain management plans cannot provide a comprehensive response to flooding

The roles and responsibilities of local government and NSW Government agencies in floodplain management and flood risk management are outlined in the [NSW Flood Prone Land Policy and Flood risk management Manual](#) (2023).

Improvements to flood risk mitigation were considered through the 2022 NSW Flood Inquiry. Read the [inquiry report and the NSW Government response](#).

As part of developing FMPs, the department provides all modelling information to the relevant Commonwealth, state, and interstate emergency management agencies so that it may assist in their future flood predictions. FMPs set rules for flood works on declared floodplains. They do not deal with flood mitigation or flood response.

2 Scope of the NSW Murray Valley FMP

The FMP establishes management zones and rules which provide clarity about where flood works may be constructed on the floodplain and to streamline the approval process for new and amended flood works.

The department is delivering multiple programs across the NSW Murray Valley region. While they do not operate in isolation, it's important to note that the plan is unrelated to the department's Reconnecting River Country Program, which is focused on removing constraints to enable more flexible use of water for the environment. For more information on this program, visit the [Reconnecting River Country Program](#) on our website.

The FMP does **not** deal with:

- the licensing of floodplain harvesting or other forms of water take
- environmental water management
- cultural watering plans
- access to land for cultural purposes
- the modification or removal of existing flood works – FMPs set rules for the assessment and determination of applications for flood work approvals. They do not set requirements for the removal of flood works
- flood mitigation or actions to manage localised flooding issues – while many historical FMPs included action plans, FMPs prepared under the WM Act only set rules for the assessment and determination of applications for flood work approvals
- emergency flood response.

2.1 Objectives of the FMP

Part 2 of the plan sets the objectives, strategies and performance indicators of the plan. Performance indicators are used to measure the success of the strategies in achieving the objectives of the plan, as shown in the examples in Table 1 below.

Each strategy may contribute to achieving one or more of the objectives, and one or more performance indicators may be measured to evaluate each of the objectives.

External influences on the floodplain, such as long and short-term climate trends and land use change, may affect progress toward achieving the objectives of the plan.

Table 1: Linkage between objectives, strategies and performance indicators in the FMP

Objective	Strategy	Performance indicator	Understanding the linkages
Facilitate the orderly passage of floodwater through the floodplain	• Delineate a floodway network that accurately represents the passage of floodwater in the floodplain. • Establish management zones with rules and assessment criteria for granting or amending of flood work approvals in the floodplain. • Establish rules and assessment criteria for flood work approvals that ensure adequate flood connectivity is maintained in the floodplain.	• Extent to which the floodway network map accurately represents the passage of floodwater in the floodplain. • Extent to which flood works, approved in accordance with the rules and assessment criteria in Part 7, and constructed or modified after the commencement of the FMP have altered the hydraulic behaviour of floodwater in the floodplain.	The floodway network map is used to inform the delineation of the management zones. Clause 4 establishes management zones in the floodplain and the provisions in Part 7 establish rules and assessment criteria for flood work approvals specific to each management zone. The plan map shows the extent of the management zones throughout the floodplain. Information about the hydraulic behaviour of monitored floods and approved flood works will be used to evaluate this objective.

More information about monitoring, evaluation and reporting is available in section 4 Implementing the FMP of this background document.

2.2 Plan maps

The plan includes a series of maps that assist in interpreting or applying the rules and assessment criteria.

The **plan map** shows the floodplain boundary and extent of the management zones throughout the floodplain. This map assists landholders in determining what part of their property is wholly or partially within the floodplain, what management zones have been applied throughout their property and, consequently, which rules and assessment criteria in Part 7 of the plan apply.

The **floodway network map** identifies areas of the floodplain where the risk to life and property from the effects of flooding are the greatest. The identification of these areas satisfies the requirement under the WM Act for the FMP to include provisions that deal with the risk to life and property from the effects of flooding.

The **ecological assets map** shows all flood-dependent ecological assets and other floodplain ecosystems throughout the floodplain. Reference to this map is needed when applying the rules and assessment criteria in Part 7 of the plan.

The **peak flood flow distribution map** shows the location of the peak discharge calculation points, and the direction of flood flows throughout the floodplain. A peak discharge calculation location is a section of the floodplain where the flow during the large design flood event is calculated for the purpose of assessing the change in flow behaviour due to proposed flood works. Reference to this map is needed when applying the rules and assessment criteria in Part 7 of the plan.

The plan maps are available in multiple ways to support the implementation of the plan:

- A0 pdf versions of the maps are published on the [department's website](#)
 - [interactive spatial map](#) – a state-wide online mapping tool to view the floodplain boundary, management zones and identified ecological assets on the floodplain
 - you can also find the floodplain management plan spatial dataset on the NSW Government's [SEED portal](#) for use in your own geographic information system.
-

3 Developing the NSW Murray Valley FMP

The department's Water Group coordinates the preparation of FMPs. The planning process is guided by a technical manual for rural floodplain management plans under the WM Act, available on the [department's website](#).

A variety of tools and information, including hydrologic and hydraulic modelling, mapping, information about ecological and cultural assets, and information about existing floodplain development is used to inform the preparation of FMPs.

The floodplain management planning approach is a 10-step process that includes:

- defining the floodplain boundary (Step 1)
- identifying hydraulic, ecological, cultural and socio-economic information about the floodplain to be used in decision-making (Steps 2–6)
- delineating management zones and developing rules (Steps 7–9)
- assessing the socio-economic impacts of the proposed floodplain management plan (Step 10).

Information about these steps is provided in the following sections.

3.1 The NSW Murray Valley Floodplain boundary

As part of the commencement of the FMP, the department has amended the Water Management (General) Regulation to:

- establish the NSW Murray Valley Floodplain, and
- repeal the:
 - Edward/Wakool Rivers Murray Valley Floodplain

- Lower Edward-Wakool Floodplain (Stage 4)
- Tuppall Bullatale Floodplain
- Stage 1: Edward and Wakool Rivers (Deniliquin to Moama-Moulamein Railway) Floodplain
- Stage 2: Edward and Wakool Rivers (Moama-Moulamein Railway to Gee Gee Bridge) Floodplain
- Stage 3: Edward and Niemur Rivers (Moama-Moulamein Railway to Liewah and Mallan) Floodplain.

The NSW Murray Valley Floodplain (the floodplain boundary), shown in Figure 1, is the area to which the FMP applies. The floodplain boundary extends downstream from Tocumwal in the east to the junction of the Murray and Murrumbidgee rivers in the west. To the south the floodplain boundary aligns with the Murray River, and to the north is generally bound by public roads.

The floodplain connects with the Murrumbidgee Valley floodplain and Billabong Creek floodplain, improving the assessment of cumulative impacts from individual flood works across the southern Murray–Darling Basin.

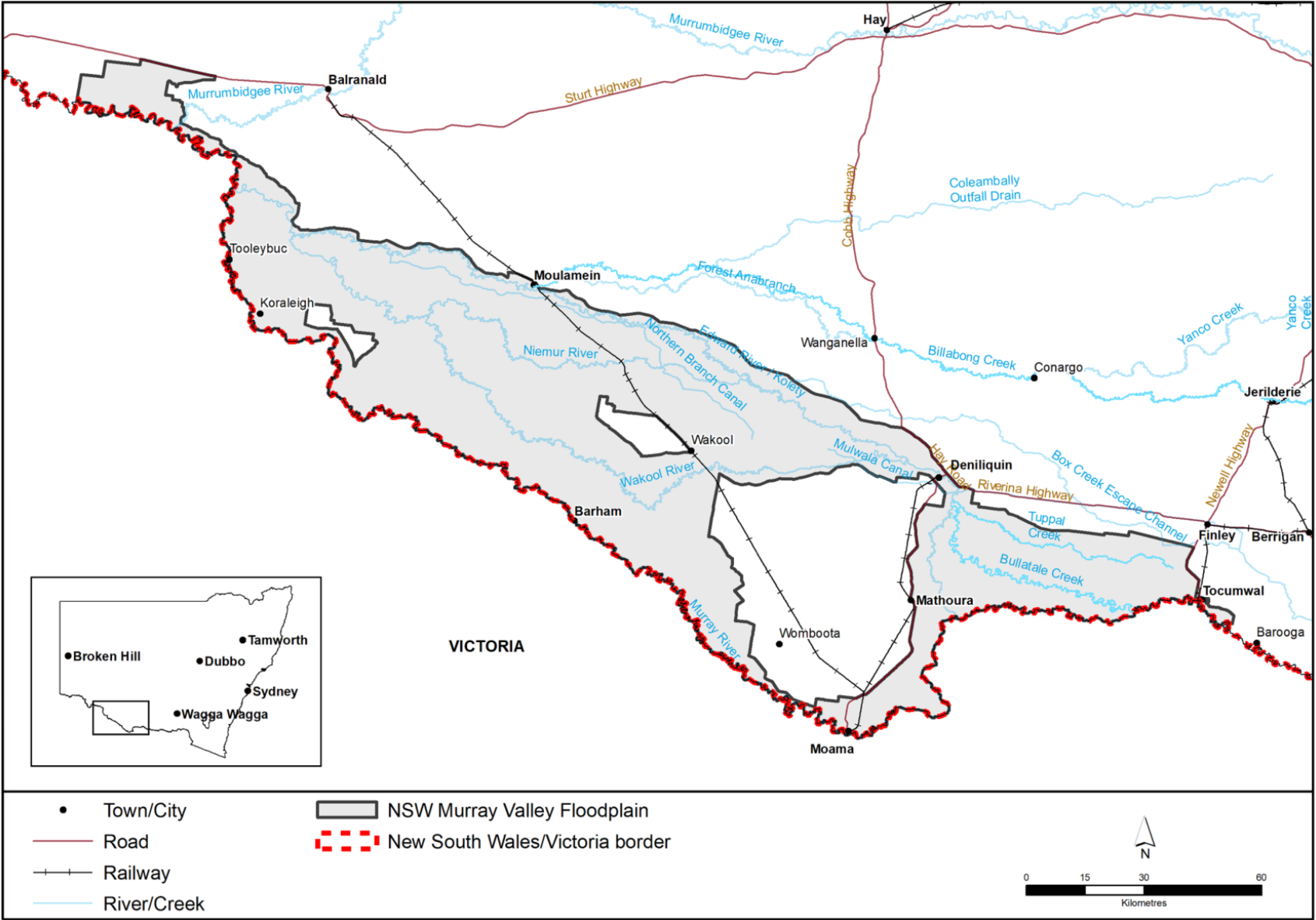
A combination of hydraulic and administrative factors, where appropriate, have been used to develop the floodplain boundary including:

- inundation data within the Murray catchment
- hydraulic model development
- the historical localised FMPs (now repealed)
- water source boundaries, as established in water sharing plans
- local government areas
- major roads and railways which act as barriers to large scale flood movement.

The department sought community feedback on the proposed floodway network during Stage 1 public consultation and Stage 2 public exhibition. In response to feedback received during both stages, the department decided changes to the floodplain boundary were not required. The feedback received can be viewed in the [What we heard reports](#) for Stage 1 public consultation and Stage 2 public exhibition.

The floodplain boundary is available in the **Plan Map** (FMP049_Version 1) published on the department's [NSW Murray Valley floodplain page](#). A state-wide interactive spatial map that includes the floodplain boundary is available on the page too. You can also find the floodplain management plan spatial dataset on the NSW Government's [SEED portal](#) for use in your own geographic information system.

Figure 1: Map of the NSW Murray Valley Floodplain



3.2 Determining the floodway network

The FMP will coordinate flood work development on the floodplain to ensure that floodwater can move freely to and from rivers and creeks. To do this, an understanding of how water moves across the landscape when it floods is required.

Five hydraulic models were developed to simulate the movement of floodwater through river channels, wetlands and the wider floodplain during the large and small design floods. This modelling process identifies areas of the floodplain with the deepest and fastest flowing floodwater and pose the greatest risk to life and property. These areas are known as floodways, and together with areas of ponding, they make up the floodway network, described below.

The floodway network is published in the **Floodway Network map** (FMP050_Version 1) on the department's [NSW Murray Valley floodplain page](#).

The floodway network is comprised of **floodways** and the **inundation extent** (ponding areas) and has been defined by:

- mapping the outputs of the hydraulic modelling
- considering the floodway networks in the historical FMP and floodplain development guidelines, and aligning with them where appropriate
- reviewing additional flood photography and satellite imagery.

The department sought community feedback on the proposed floodway network during Stage 1 public consultation and made refinements in response to the feedback received. The feedback and changes made can be viewed in the [What we heard report](#) for Stage 1 public consultation.

Further refinements were made to the floodway network following feedback about the extent of the management zones during Stage 2 public exhibition. These changes were to ensure consistency between the floodway network and management zones. More information about refinements made to the management zones following Stage 2 public exhibition can be found in section 3.7.1 Management zones.

More information about how the hydraulic models and the floodway network were developed is available in Appendix 1 Development of the floodway network.

3.2.1 Design floods

A design flood is a flood of known magnitude that can be modelled and used for planning or engineering purposes. They are usually based on recorded historical events that are preferably within the living memory of a community. Selection of a design flood is based on an understanding of flood behaviour and associated flood risk. Multiple design floods are often selected to account for the social, economic, ecological and cultural consequences associated with floods of different magnitudes.

Design flood events that are selected will be described through the following attributes:

- the flood event that it is based on (month, year)
- where the data is taken from, such as a section of river and associated gauge

- the probability of an equivalent (or larger) flood event occurring in any given year, known as the annual exceedance probability (AEP).

A large design flood is a large magnitude flood event that generally has a 5% or less probability of occurring in any given year (AEP) while a small design flood is a smaller magnitude flood event that has at least a 10% probability of occurring in any given year (AEP). There may be variances in the AEP associated with a large or small design flood because of the nature of the flood event on which the design flood is based.

The FMP has been developed using 2 design floods of different magnitudes. Five hydraulic models were created to simulate the movement of these design floods through the river channels and floodplain. The following design floods were used to model the floodway network:

- large design flood of June to December 2022: 2.5% AEP at the Murray River at Barham gauge (409005)
- small design flood of September to December 2016: 16% AEP at the Murray River at Barham gauge (409005).

More information on how the design floods were selected, and the associated hydraulic models is available in Appendix 1 Development of the floodway network.

The department sought community feedback on the proposed design floods during Stage 1 public consultation and Stage 2 public exhibition. No changes were made to the design floods in response to public feedback. The feedback received can be viewed in the [What we heard reports](#) for Stage 1 public consultation and Stage 2 public exhibition.

3.2.2 About the floodway network

3.2.2.1 Floodways

Throughout a floodplain, there will be pathways of fast-flowing floodwater during times of flood. These areas are floodways and are part of the floodway network. They are often aligned with naturally defined channels. Floodways are high-risk areas that, even if only partially blocked, would cause significant changes in the movement of floodwater across the floodplain. It is a critical area of the floodplain as it allows water to leave or return to a river or creek during times of flood or deliver floodwater to ecological assets and Aboriginal cultural values that depend on it.

Floodways pose the greatest risk to life and property during times of flood.

3.2.2.2 Inundation extent (ponding areas)

Along the floodways there will be areas where floodwater breaks out (flood discharge) and forms ponds. These areas are known as the inundation extent and are also part of the floodway network. The inundation extent is critical to storing floodwater during times of flood. Without these areas, the depth and speed of the floodwater in the floodway would dramatically increase. It is important that flood works constructed in these areas are coordinated so that they do not block inundation, particularly during large floods.

3.2.2.3 Other areas of the floodplain

The remaining area of the floodplain can be categorised as **flood fringe** areas or **flood-protected areas**. These areas do not form part of the floodway network. The flood fringe is an area which may be flooded but is not considered critical in the flow of water during times of flood. Flood-protected areas do not receive floodwater. This may be due to the area being higher ground or the presence of existing flood works prevents the passage of floodwater.

3.2.3 Consideration of unapproved flood works

The development of the floodway network includes consideration of existing flood works in the landscape, such as levees, embankments and roads. Each of these features can have a significant impact on the movement of floodwater and must be accounted for in the hydraulic models. Some of these flood works do not have a flood work approval. A process for determining how unapproved flood works were considered in the development of the floodway network is shown in Figure 4 in Appendix 1 Development of the floodway network.

This process considers:

- the potential flooding impacts of the unapproved work
- whether the impact is contained within the landholding or if it impacts on other neighbouring properties
- whether the impacted area is recognised as a floodway within the historical FMP and guidelines for floodplain development.

Unapproved flood works are a significant issue for many local landholders. To report concerns regarding unapproved works, please visit the Natural Resources Access Regulator (NRAR) website at nrar.nsw.gov.au/report-suspicious-water-activities.

You can also contact NRAR on 1800 633 362 during business hours or via email nrar.enquiries@nrar.nsw.gov.au.

3.3 Identified Aboriginal cultural assets and values

Aboriginal cultural assets and values on the floodplain can be:

- flood-dependent, such as waterholes, fish traps or scarred trees that require inundation
- flood-impacted, such as Aboriginal burial grounds or shell middens that can be damaged by scour and erosion caused by flooding or directly during the construction of a flood work.

Aboriginal cultural assets and values on the floodplain are identified in the FMP to support their protection and restoration, which in turn provides social and economic benefits to the community. Healthy waterways and floodplains are critical to the culture and wellbeing of Aboriginal people. Water provides food, kinship, connection, recreation, stories, songlines and healing.

The FMP aims to protect Aboriginal cultural assets and values on the floodplain by establishing rules for flood works to:

- prevent direct damage that may be caused during the construction of flood works
- prevent an increase in erosion that may result from changes to flood flows
- maintain the flow of floodwater to Aboriginal cultural values that need this water to survive.

Aboriginal cultural assets and values within the floodplain are registered on the [Aboriginal Heritage Information Management System](#) (AHIMS). Identified Aboriginal cultural assets and values have been considered in the mapping of the management zones. For more information, see section 3.7.1 Management zones.

As part of assessing and determining an application for a flood work approval, a search of AHIMS must also be conducted. To ensure that Aboriginal cultural assets and values are protected from impacts associated with flood works, the department has been explaining and promoting the use of AHIMS as part of consultation with Aboriginal communities.

The department sought community feedback on the identified Aboriginal cultural assets and values on the floodplain during Stage 1 public consultation. For more information on consultation with Aboriginal communities in the floodplain, including the feedback received, please visit the [NSW Murray Valley floodplain page](#) to read:

- Appendix 2 of the Report to assist Stage 1 public consultation
- the What we heard during Stage 1 public consultation report
- the What we heard during Stage 2 public exhibition report.

Information on how FMPs can protect Aboriginal cultural assets and values and the AHIMS database is also available on the [department's website](#) (navigate to 'Developing floodplain management plans and then 'Community consultation').

3.4 Identified heritage sites

Heritage sites may be sensitive to changes in flood behaviour or disturbance from flood work construction. Heritage sites are cultural heritage objects and places as listed on the following Commonwealth, state and local government heritage registers:

- Australian Heritage Database
- NSW Aboriginal Heritage Information Management System
- NSW Historic Heritage Information Management System
- NSW State Heritage Register.

Some Aboriginal cultural assets and values may also be listed on heritage registers and are discussed in the previous section.

During the development of the FMP there was no identified flood-dependent heritage sites in the floodplain. Some heritage sites, such as historic buildings or cemeteries, may be flood-impacted as they could be damaged by flooding or directly impacted during the construction of a flood work.

The FMP aims to protect heritage sites in the floodplain by establishing rules for flood works to:

- prevent direct damage that may be caused during the construction of flood works
- prevent an increase in erosion that may result from changes to flood flows

- maintain the flow of floodwater to heritage that need this water to survive (should any flood-dependent heritage sites be identified in the future).

A search of the [State Heritage Inventory](#) must be conducted as part of assessing and determining an application for a flood work approval. This online search tool holds information about most statutory protected heritage items in NSW, including the NSW State Heritage Register.

Find out more about heritage listed items and significant sites in NSW by visiting the [Heritage NSW website](#).

The department sought community feedback on the identified heritage sites on the floodplain during Stage 1 public consultation. Feedback received in response to the identified heritage sites presented during Stage 1 public consultation can be viewed in the [What we heard report for Stage 1 public consultation](#).

3.5 Identified ecological assets and values

A key objective of the FMP is to maintain flood connectivity to flood-dependent ecological assets. This means that flood works should not block the floodways that connect them to floodwaters.

Flood-dependent ecological assets rely on flooding to maintain their ecological character and sustain essential processes. Flood-dependent ecological assets are identified in FMPs to support their protection, which in turn provides social and economic benefits to the community.

A similar process was applied in the existing localised FMPs (now repealed) with the identification and inclusion of flood-dependent ecosystems and 'areas of possible wetland value', and the requirement for flood works to be assessed against section 166 of the *Water Act 1912* (repealed) and Part 5 of the *Environmental Planning and Assessment Act 1979* to ensure connectivity to identified ecological sites and protection of fish passage.

Within the floodplain, the following types of ecological assets were identified as part of the development of the FMP:

- flood-dependent ecological assets, that are within the floodway network:
 - semi-permanent wetlands (non-woody)
 - other flood-dependent ecosystems, including floodplain wetlands (flood-dependent shrubland wetlands), flood-dependent forest/woodland (wetlands) and flood-dependent woodlands
- other floodplain ecosystems, that are outside of the floodway network.

The identified ecological assets are published in the **Ecological asset map** (FMP051_Version 1) on the department's [NSW Murray Valley floodplain page](#). An interactive spatial map that includes the ecological assets is available on the page too. You can also find the floodplain management plan spatial dataset on the NSW Government's [SEED portal](#) for use in your own geographic information system.

As part of assessing and determining an application for a flood work approval, a search of this spatial dataset must be undertaken. All applications for a flood work approval must demonstrate that flood or flow connectivity is maintained to these ecological assets. More information about the

applicable rules and assessment criteria for flood works is provided in section 3.7.2 Rules for flood works in each management zone.

3.5.1 About the identified flood-dependent ecological assets

The ecological assets are categorised according to the flooding requirements of their vegetation communities, which correlates to the degree of connectivity required to the floodway network. For example, wetlands and their associated vegetation communities are highly flood-dependent and therefore will either be located within the floodway network or have a direct connection to the floodway network.

The ecosystems also provide important habitat for native fish, amphibians, reptiles, waterbirds, woodland birds and mammals, and invertebrate and microbial biota. Habitats for fish (and fish passage), waterbirds and other water-dependent fauna have been identified and were considered in the development of the FMP.

The ecological assets have been identified using the best available vegetation mapping and survey information, including the NSW State Vegetation Type Map¹ and wetland mapping. More information about how ecological assets have been identified and categorised is available in Appendix 2 Ecological asset identification and categorisation.

The department sought community feedback on the identified ecological assets during Stage 1 public consultation. In response to feedback received, the department made multiple refinements to the identified ecological assets throughout the floodplain. The feedback received and the changes made can be viewed in the [What we heard report for Stage 1 public consultation](#). Further refinements were made to the identified ecological assets prior to Stage 2 public exhibition and prior to commencement to remove:

- assets that were no longer visible within developed or cultivated areas
- minor erroneous assets that overlapped major water infrastructure
- isolated trees in areas that have previously been cleared
- gardens associated with rural dwellings and outbuildings.

3.6 Socio-economic information

There are approximately 32,503 people in the NSW Murray Valley, with urban centres providing the population hubs². The floodplain includes the urban areas of Tocumwal, Deniliquin, Moama, Moulamein and Barham.

The following 4 local government areas are within the floodplain boundary:

- Berrigan Shire Council

¹ Department of Planning and Environment (2022) NSW State Vegetation Type Map. Release C1.1.M1.1 (December 2022)

² Australian Bureau of Statistics Data by region 2011-2023, by ASGS Statistical Level 2 (ASGS Edition 3 (2021 – 2026)) <https://dbr.abs.gov.au/index.html>

- Federation Council
- Greater Hume Council
- Murray River Council.

The floodplain covers the traditional lands of the Wamba Wamba/Wemba Wemba, Perrepa Perrepa, Baraba Baraba, Bangerang, Yorta Yorta, Wadi Wadi, Muthi Muthi, and Ngarrindjeri peoples.

The Murray catchment represents one-fifth of the total area of the Murray–Darling Basin and is one of the most significant agricultural areas in Australia.

Most of the central Murray is used for agricultural purposes, with grazing being the dominant land use. The flat riverine plains make the region suitable for a variety of dryland and irrigated cropping enterprises. The Murray Irrigation Area also resides within the Central Murray (Murray Riverina catchment) and is the largest irrigation scheme in NSW.

The Murray catchment supports a range of water-dependent ecosystems, including instream aquatic habitats, riparian forests, and floodplain watercourses, woodlands and wetlands.

Based on engagement activities undertaken for Stage 1 public consultation, private landholders in the floodplain range from small family-owned farms to large corporate agribusinesses with major irrigation infrastructure.

To enhance agricultural productivity, works have been built on the floodplain to improve land used for irrigated cropping, perennial horticulture, dryland cropping and grazing. Typically, flood works such as levees, earthworks, banks and channels are built to protect crops, land, stock and properties from flooding, provide on farm access, and to deliver and store irrigation, stock, and domestic water. Delivery of water is also supported by flood works owned and managed by irrigation corporations and private irrigation districts. It is the construction and use of these flood works, both existing and proposed, that is affected by the FMP.

More information about the region's economy and an assessment of the impact of the FMP is available in section 3.9 and Appendix 5 Socio-economic impact assessment.

3.7 Management zones and rules

The FMP aims to manage the construction or modification of flood works on the floodplain by:

- **establishing management zones** that reflect the presence and movement of floodwater during times of flood, and
- **applying rules and assessment criteria specific to each management zone** that protect the passage of floodwater while minimising the risk to life and property from the effects of flooding.

3.7.1 Management zones

The management zones are published in the **Plan Map** (FMP049_Version 1) on the department's [NSW Murray Valley floodplain page](#). An interactive spatial map that includes the management zones is available on the page too. You can also find the floodplain management plan spatial dataset on the NSW Government's [SEED portal](#) for use in your own geographic information system.

The management zones represent the hydraulic, ecological or Aboriginal cultural (or combination of) attributes of the land. No attribute was given precedence over another. Instead, a classification tool,

shown in Figure 2, was applied to each area of the floodplain to determine the appropriate management zone.

Based on the management zone assigned, the relevant rules and assessment criteria apply. These rules are detailed in section 3.7.2 and are reflective of the nature of the area and associated impact that a flood work may have on the movement of flood water and risk to life and property.

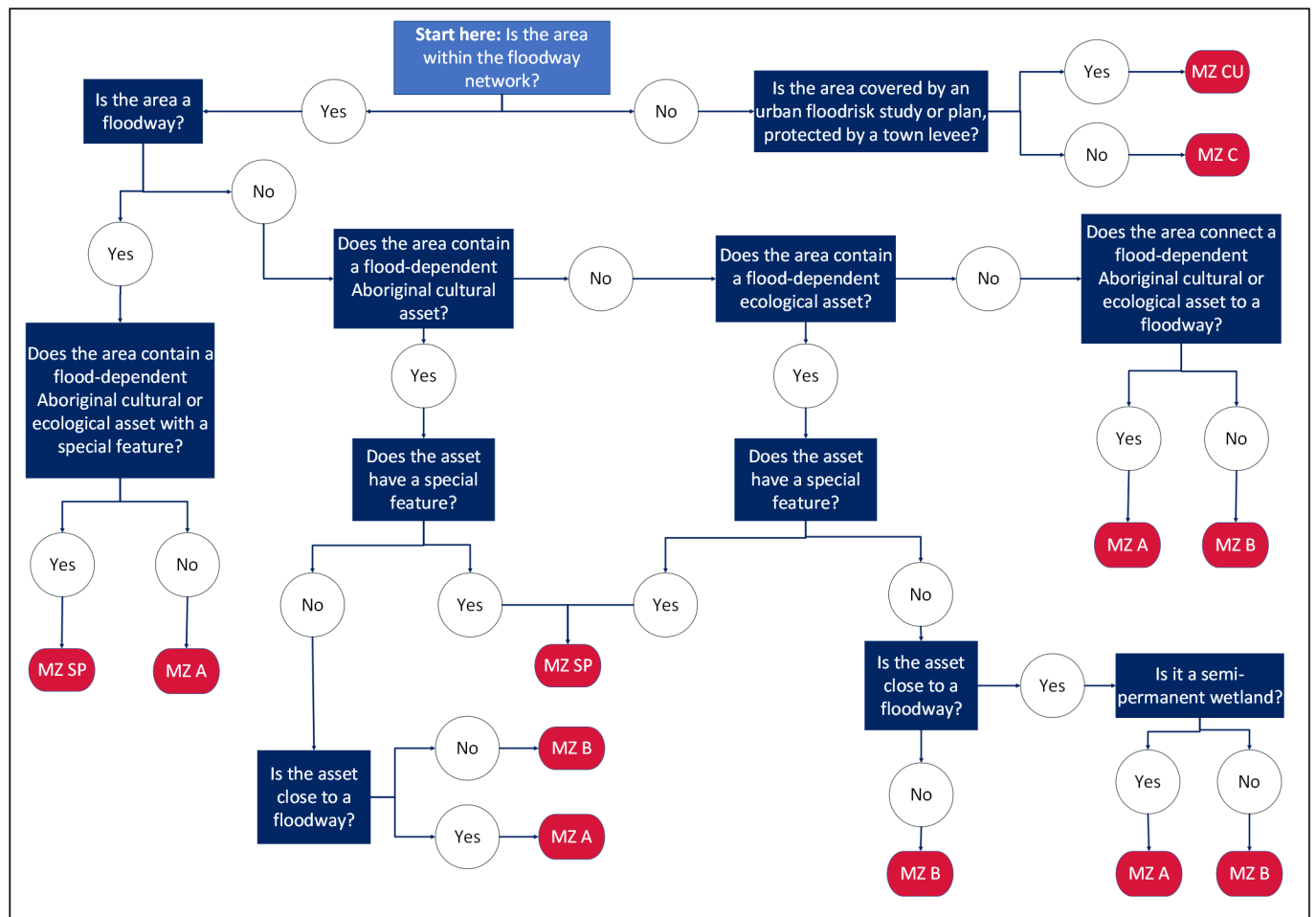
The percentage of the floodplain covered by:

- management zone A (predominantly floodways) is 8.4%
- management zone B (inundation extent and flood storage) is 23.1%
- management zone C (flood fringe) is 56.5%
- management zone CU (urban areas) is 0.5%
- management zone SP (special protection) is 11.5%.

More information about the application of the management zone classification tool is available in Appendix 3 Management zone classification.

The floodway network forms the basis of the management zones. More information about the delineation of the floodway network is available in section 3.2 Determining the floodway network and Appendix 1 Development of the floodway network.

Figure 2: Management zone classification tool



The department sought feedback on the proposed management zones, particularly at a property scale, during Stage 2 public exhibition. In response to feedback received during public exhibition, the department made multiple refinements to the spatial extent of the management zones prior to the commencement of the FMP. These refinements are shown on the maps in Appendix 2 of the [What we heard report for Stage 2 public exhibition](#).

3.7.2 Rules for flood works in each management zone

In NSW all flood works require a flood work approval unless an exemption applies.

Part 7 of the plan sets the rules and assessment criteria which aim to restrict the types of flood works constructed in management zones A and SP while ensuring comprehensive rules and assessment criteria are applied to all flood works throughout the floodplain.

This section describes the types of flood works that can be submitted for a flood work approval. A [rule summary sheet](#) is also available on the department's website.

For more information on exempt flood works, please refer to the [exemptions to flood work approvals fact sheet](#) on WaterNSW's website. For more information on the flood work approval processes undertaken by WaterNSW, please see the [WaterNSW approvals webpage](#).

3.7.2.1 Management zones A and SP rules

The construction of a flood work in a floodway (management zone A) can significantly increase the risk to life and property during times of flood; both on the property where the flood work is constructed and on neighbouring properties.

Areas which contain flood-dependent ecological assets that have a special feature (management zone SP), such as important wetlands, are vulnerable to the impacts of flood works. Further, they are heavily reliant on floodwater to survive.

Due to these reasons, flood works proposed to be constructed in management zone A and SP are restricted to specific types that are essential for the protection of life and property, or improvement of the floodplain. Each type of flood work permitted will be subject to size or height restrictions to ensure the impact on the passage of floodwater is minimised. Please refer to Table 2 for more information.

There are additional types of flood works permitted for those that were constructed prior to the commencement of the FMP. All flood works in management zone A and SP will be assessed using the **standard assessment criteria** while enhancement flood works will also be assessed using the **hydraulic assessment criteria**.

Table 2: Types of flood works permitted in management zones A and SP and associated specifications

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
Standard access road (within a property)	To ensure landholders have basic provisions to access property.	Permitted in management zone A and SP.	Permitted in management zone A and SP.	Maximum height of 30 cm above the natural surface of the ground. Causeways at least every 200 m, at the lowest point of the floodway, are no higher than the natural surface of the ground and comprise at least 10% of the total length of the road within management zone A. Borrow associated with construction/maintenance is located on the downstream side of the access road and is no deeper than 15 cm below the natural surface of the ground.

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
Primary access road (to/from a house)	To further ensure landholders have basic provisions to access property or evacuate during a major flood event by permitting higher level roads that directly service homes.	Permitted in management zone A. Not permitted in management zone SP.	Permitted in management zone A and SP.	Maximum height of 50 cm above the natural surface of the ground. Causeways at least every 200 m, at the lowest point of the floodway, are no higher than the natural surface of the ground and comprise at least 10% of the total length of the road within management zone A. Borrow associated with construction/maintenance is located on the downstream side of the access road and is no deeper than 15 cm below the natural surface of the ground.
Supply channel	To ensure landholders can access water rights from water sources.	Permitted in management zone A. Not permitted in management zone SP.	Permitted in management zone A and SP.	Height must be below the natural surface of the ground. Allow for the passage of floodwater and prevent diversion of water. Spoil associated with construction/maintenance must be located in a heaped line parallel to flow direction with a maximum height of 10 cm above the natural surface of the ground and not block more than 5% of the width of management zone A (at the location of the channel and perpendicular to flow direction).

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
Stock refuge	To account for animal welfare and to minimise a landholder's potential to lose stock to floodwaters.	Permitted in management zone A and SP.	Permitted in management zone A and SP.	Maximum area of 10 hectares and no other stock refuge in that area. Total maximum area of all stock refuges is no more than 5% of total property area. Does not block more than 5% of the width of management zone A (at the location of the refuge and perpendicular to flow direction).
Infrastructure protection work	For protecting high value infrastructure such as homes and sheds. To minimise the risk to life and property from flooding.	Permitted in management zone A and SP.	Permitted in management zone A and SP.	Maximum area enclosed by the work is: 10% of the total area of the property if the maximum area of management zone A on the property is no more than 20 hectares, or 2 hectares or 1% of the total area of the property (whichever is largest) if the maximum area of management zone A on the property is more than 20 hectares. Does not block more than 5% of the width of management zone A (at the location of the work and perpendicular to flow direction).

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
Flood enhancement works (Aboriginal cultural, ecological or heritage site)	To improve flood connectivity to a recognised flood-dependent ecological or Aboriginal cultural or heritage site.	Permitted in management zone A and SP.	Permitted in management zone A and SP.	The primary purpose must be to improve flood connectivity to a flood-dependent ecological asset, Aboriginal cultural value or heritage site. The improvement in flood connectivity must contribute to the protection or conservation of one or more flood-dependent ecological assets, Aboriginal cultural values or heritage sites. Must be part of an active government program such as the <u>Reconnecting River Country Program</u>, a cultural watering plan or a natural resource management project with Local Land Services. Comply with both the standard and hydraulic assessment criteria.

Type of flood work	Purpose	New works permitted	Existing works permitted	Specifications
Protection works (Aboriginal cultural or heritage site)	For protecting flood-impacted cultural sites such as burial grounds/ cemeteries, heritage buildings or shell midden sites that may be damaged by erosion or inundation.	Permitted in management zone A. Not permitted in management zone SP.	Permitted in management zone A and SP.	Demonstrate protection for a flood-impacted Aboriginal cultural asset or heritage site listed on AHIMS or heritage register. Does not block more than 5% of the width of management zone A (at the location of the work and perpendicular to flow direction). Maximum area enclosed by the work is: • 10% of the total area of the property if the maximum area of management zone A on the property is 20 hectares, or • 2 hectares or 1% of the total area of the property (whichever is largest) if the maximum area of management zone A on the property is greater than 20 hectares.

3.7.2.2 Existing flood works in management zones A and SP

For flood works that were constructed in a floodway (management zone A) or within an area that contains a flood-dependent ecological asset that has a special feature (management zone SP) prior to the FMP commencing, there are some variations in the types of works permitted and associated rules. These variations are designed to ensure that a flood work approval can be obtained.

The existing flood work must not be the subject of an undetermined or previously refused application for a flood work approval. If an existing flood work, of the type listed below, cannot comply with the specifications listed in Table 2, a flood work approval may be granted, if it complies with the standard assessment criteria:

- access roads (standard and primary)
- stock refuge
- infrastructure protection work
- supply channel.

In addition to the types listed in Table 2, existing above ground supply channels are permitted within management zones A and SP, subject to complying with the standard assessment criteria.

The rules for existing works are intended to provide a pathway for the approval of some relatively minor flood works. They are not intended for the retrospective approval of major irrigation infrastructure.

3.7.2.3 Management zones B, C and CU

Any type of flood work will be permitted in management zones B, C and CU. All flood works in management zones B, C and CU will be assessed using the standard assessment criteria.

Larger flood works in management zone B and flood works that may cause a significant impact in management zones C and CU will also be assessed using the hydraulic assessment criteria.

Please refer to section 3.7.3, Table 3 and Table 4 for more information.

Some flood works are exempt from requiring a flood work approval in management zones B, C and CU. For more information on exempt flood works, please refer to the [exemptions to flood work approvals fact sheet](#) on the WaterNSW website.

3.7.2.4 Advertising requirements

The requirement to advertise a flood work application applies in management zone B, when the flood work is:

- greater than 40 cm above the natural surface of the ground, or
- a stock refuge with a maximum area larger than 10 hectares and there is no other stock refuge in that area, or
- a stock refuge on a property and the total maximum area of all stock refuges is larger than 5% of total property area, or
- an infrastructure protection work with an area that is larger than 1% of the total area of the property.

When a flood work application is required to be advertised, the hydraulic assessment criteria will also apply. This is because flood works that exceed the above thresholds are assumed to be larger in area and/or height and there is a need to manage impacts on neighbouring properties, areas of Aboriginal cultural significance, heritage sites and the environment.

3.7.2.5 Existing flood works in management zone B

Across the Billabong Creek, Murrumbidgee Valley, NSW Murray Valley, and Lachlan Valley floodplains, landholders and peak water user groups have consistently raised concerns about having to get flood work approvals for existing flood works in areas that are outside of the FMPs historically made under the *Water Act 1912*. Of particular concern is irrigation infrastructure and access roads or farm tracks that have been in place for decades.

In many cases, there is a lack of awareness of what constitutes a flood work and the legal requirement for a flood work approval, including areas without an in-force FMP. However, the objections mostly relate to the cost and inconvenience of having to get a flood work approval.

In response to this feedback, a temporary rule set has been included in the FMP for existing flood works in management zone B (inundation extent).

Unapproved flood works located in management zone B that were constructed prior to 7 July 2000 will be required to meet the standard assessment criteria only. The relevance of 7 July 2000 is the commencement of the Water Amendment (Flood Control Works) Act 1999, which made provision for the approval of works that may affect or prevent flooding.

This temporary rule provides a pathway for the approval of existing flood works constructed prior to 7 July 2000 by simplifying the assessment process and potentially avoiding the cost of preparing a flood study.

However, if an existing unapproved flood work in management zone B:

- has the potential to impact high value infrastructure such as roads, railways or dwellings, or
- has existing flood works nearby that have a limited height condition, or
- may create a new or restore an old flood flow path,

the flood work must be advertised and meet the hydraulic assessment criteria, including cumulative impact assessment. This may require a flood study (hydraulic modelling). This assessment will ensure that impacts on neighbouring properties and the environment are avoided or minimised.

This rule will only apply for the first three years following commencement of the FMP (until 30 June 2029) to encourage landholders to obtain a flood work approval.

Proposed new flood works or modification of existing approved flood works would continue to be assessed against the standard assessment criteria and hydraulic assessment criteria as outlined in section 3.7.3, Table 3 and Table 4.

3.7.2.6 Flood works in management zones C and CU

For flood works that were constructed in management zones C or CU prior to the FMP commencing, the same rules and assessment criteria apply for both new and existing flood works.

Applications for flood works in management zones C and CU will not require advertisement.

3.7.3 Assessment criteria

Part 7 of the FMP specifies the assessment criteria, which are common throughout each management zone. However, there are some criteria which may not be applied in certain management zones or only applied to certain types of flood works. There are two sets of assessment criteria:

1. **standard assessment criteria** (Table 3) which applies to all flood works, and
2. **hydraulic assessment criteria** (Table 4) apply to the following types of flood works:
 - a. enhancement flood works in management zones A and SP
 - b. flood works in management zone B that require advertisement (larger works) unless constructed prior to 7 July 2000³, or

³ This provision for works constructed prior to 7 July 2000 only applies until 30 June 2029.

- c. flood works constructed prior to 7 July 2000 in management zone B4 or flood works in management zone C or CU, which:
 - i. may impact high value infrastructure such as roads, railway or dwellings, or
 - ii. have existing flood works nearby that have a limited height condition, or
 - iii. may create a new or restore an old flood flow path.

If a flood work is required to comply with the hydraulic assessment criteria, the cumulative impact criteria within the standard assessment criteria does not apply. This is because a cumulative impact assessment is undertaken as part of the hydraulic assessment criteria.

The purpose of the assessment criteria is to manage impacts on neighbouring properties, areas of Aboriginal cultural significance, heritage sites and the environment. This is consistent with the water and floodplain management principles as set out in sections 5(2) and 5(6) of the WM Act. The use of hydraulic modelling is generally required to demonstrate that the hydraulic assessment criteria has been met. The cost for hydraulic modelling will vary depending on the scale and nature of the flood work.

All types of flood works are permitted within management zones B, C and CU subject to complying with the advertising requirements and assessment criteria specified in Table 3 and Table 4.

⁴ This provision for works constructed prior to 7 July 2000 only applies until 30 June 2029.

Table 3: Summary of the standard assessment criteria for flood work applications in each management zone

Note: a cross means that the assessment criteria do not apply in this management zone.

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
Impacts to ecological assets, Aboriginal cultural assets or heritage sites	Maintain adequate flood connectivity under a range of flood scenarios, including the large and small design flood, to flood-dependent ecological assets, flood-dependent Aboriginal cultural assets, flood-dependent heritage sites and facilitate fish passage⁵. Maintain adequate flow connectivity to floodplain ecosystems (in areas outside of the floodway network). Not disturb the ground surface or cause erosion to an Aboriginal cultural asset or heritage site during construction or modification of the work.	✓	✓	✓	✓	✓
Drainage impacts	Maintain adequate drainage in areas on the property, including neighbouring properties, that may be affected by the flood work.	✓	✓	✓	✓	✓

⁵ Fish passage refers to connectivity that allows native fish species to move between upstream and downstream habitats as well as adjacent riparian and floodplain areas. Areas of key fish habitat include rivers, creeks and flood flow paths and are available on the [Fisheries NSW spatial data portal](#).

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
Cumulative impacts	Consider the cumulative impact of the flood work and other existing works located on the property to adjacent properties, any other properties affected by the flood work and the floodplain environment.	 Not required for flood enhancement works as these works are required to meet the hydraulic assessment criteria.				 Not required for flood enhancement works as these works are required to meet the hydraulic assessment criteria.

Table 4: Summary of the hydraulic assessment criteria for flood work applications in each management zone

Note: Hydraulic modelling is generally required to demonstrate that these assessment criteria have been met.

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
Redistribution of flood flow	Maximum 5% redistribution of peak flood flow on neighbouring properties that may be affected by the flood work (compared to peak flood flow under existing development conditions for a range of flood scenarios including the large design flood).	 Flood enhancement works only.	 For works that require advertisement and existing flood works constructed prior to 7 July 2000 that may have significant impacts.	 In limited circumstances.	 In limited circumstances.	 Flood enhancement works only.
Change in flood levels	Maximum 10 cm increase in flood levels on neighbouring properties that may be affected by the flood work (compared to flood levels under pre-development and existing development conditions for a range of flood scenarios including the large design flood). Not increase flood levels that would result in impacts to high value infrastructure (compared to flood levels under pre-development and existing development conditions for a range of flood scenarios including the large design flood).	 Flood enhancement works only.	 For works that require advertisement and existing flood works constructed prior to 7 July 2000 that may have significant impacts.	 In limited circumstances.	 In limited circumstances.	 Flood enhancement works only.

Theme	Assessment criteria	Management zone A	Management zone B	Management zone C	Management zone CU	Management Zone SP
Change in flood flow velocity	Maximum 50% increase in flood flow velocity on the property and neighbouring properties that may be affected by the flood work (compared to flood flow velocity under pre-development and existing development conditions for a range of flood scenarios including the large design flood) unless: - increases greater than 50% are isolated on the property and average impact across the property is less than 50%, and - increases are not greater than 50% at the property boundary. Not increase flood flow velocity that would result in more than minimal soil erosion on the property and neighbouring properties that may be affected by the flood work taking into account the ground cover on those properties.	 Flood enhancement works only.	 For works that require advertisement and existing flood works constructed prior to 7 July 2000 that may have significant impacts.	 In limited circumstances.	 In limited circumstances.	 Flood enhancement works only.
Redistribution of flood flow (Cumulative impact)	Maximum 5% redistribution of peak flood flow at any of the peak discharge locations shown on the peak flow distribution map (compared to redistribution under existing development conditions). Maximum 5% redistribution of peak flood flow at any location and under any other flood scenario considered relevant by the Minister.	 Flood enhancement works only.	 For works that require advertisement.	 In limited circumstances.	 In limited circumstances.	 Flood enhancement works only.

3.8 Consideration of historical planning arrangements

Consideration was given to the historical floodplain management arrangements in the following statutory and non-statutory documents when developing the FMP. Further, the boundaries of the existing designated floodplains have been incorporated into the boundary of the NSW Murray Valley Floodplain.

As part of the commencement of the FMP, the department has:

- repealed the following localised FMPs prepared under the *Water Act 1912*:
 - Tuppal and Bullatale Creeks Floodplain Management Plan (2006)
 - Stage 1: Edward and Wakool Rivers (Deniliquin to Moama-Moulamein Railway) Floodplain Management Plan (2011)
 - Stage 2: Edward and Wakool Rivers (Moama-Moulamein Railway to Gee Gee Bridge) Floodplain Management Plan (2011)
 - Stage 3: Edward and Niemur Rivers (Moama-Moulamein Railway to Liewah and Mallan) Floodplain Management Plan (2011)
 - Lower Edward-Wakool (Stage 4) Noorong Road to Wakool Murray Junction Floodplain Management Strategy / Plan (2000/2005)
- amended the Water Management (General) Regulation 2025 to:
 - repeal the Tuppal and Bullatale Creeks floodplain
 - repeal the Stage 1: Edward and Wakool Rivers (Deniliquin to Moama-Moulamein Railway) floodplain
 - repeal the Stage 2: Edward and Wakool Rivers (Moama-Moulamein Railway to Gee Gee Bridge) floodplain
 - repeal the Stage 3: Edward and Niemur Rivers (Moama-Moulamein Railway to Liewah and Mallan) floodplain
 - repeal the Lower Edward-Wakool (Stage 4) Noorong Road to Wakool Murray Junction floodplain,
 - repeal the Edward/Wakool Rivers Murray Valley Floodplain
 - establish the NSW Murray Valley Floodplain.

A comprehensive comparison of the historical localised FMP against the rules in the new FMP is provided in Appendix 4 Comparison with historical planning arrangements.

3.9 Assessing socio-economic impacts of the FMP

A socio-economic impact assessment is a useful tool to help understand the potential range of impacts of a proposed change, and the likely response if the change occurs. This understanding can help design impact mitigation strategies to minimise negative and maximise positive impacts of any change.

A qualitative assessment was undertaken to consider the potential impacts of the FMP. This assessment, as outlined in Appendix 5 Socio-economic impact assessment includes information about the nature of the change, the groups who are impacted by the FMP, benefits of the FMP and measures to mitigate and manage potential impacts.

The assessment found that while there are some localised negative impacts on individual landholders, there are significant benefits from the implementation of the FMP that are expected to outweigh these localised negative impacts.

3.10 Other components of the FMP

There are several other components of the FMP which, in some instances, do not directly relate to the rules for flood work approvals and criteria that will be used to assess applications.

Under the WM Act, an FMP must include provisions that relate to the:

- preservation and enhancement of water quality
- monitoring and reporting requirements
- conditions that a flood work approval will have applied
- circumstances when the FMP may be amended
- identification of existing and natural flooding regimes (frequency, duration, nature and extent)
- identification of ecological benefits of flooding
- identification of existing flood works (management, benefit, ecological impacts and cumulative impacts)
- risk to life and property from the effects of flooding.

Below is a description of how each requirement in the FMP is met.

3.10.1 Water quality

Part 2 of the FMP sets the objectives, strategies and performance indicators. The performance indicators are used to measure the success of the strategies in achieving the objectives of the FMP, as described in section 2.1.

The FMP sets the following objective in relation to the preservation and enhancement of water quality: contribute to the protection of water quality within the floodplain to support flood-dependent ecosystems and social, cultural and economic values.

The first strategy designed to achieve this objective is the establishment of rules and assessment criteria for flood work approvals that ensure flow velocity is minimised in the floodplain. This prevents erosion and consequential impacts on water quality.

The second strategy designed to achieve this objective is the proposed mandatory condition that requires all flood works to minimise erosion during construction and use.

3.10.2 Mandatory conditions

As required under the WM Act, part 8 of the FMP specifies the conditions that apply to flood work approvals. These are known as mandatory conditions.

The first mandatory condition in the FMP requires notice to be given to WaterNSW of an intention to decommission an **approved** flood work and again when the flood work has been decommissioned. The decommissioning process is to ensure that the area where the approved flood work is located is returned to the height of the natural surface of the ground and that potential flooding impacts on neighbouring properties that may result from the removal of the flood work are considered.

When an approved flood work is decommissioned, the flood work approval will either require amendment to remove the individual flood work (for example, removed from the list of works and/or from the associated map) or be surrendered.

The second mandatory condition in the FMP requires erosion to be prevented during the construction and use of a flood work. This aims to protect water quality and is described in section 3.10.1.

If deemed appropriate, the Minister may apply a discretionary condition to a flood work approval at any time. This may involve conditions related to the protection of the environment. If a decision is made to apply a discretionary condition, the approval holder will be provided with a written notice and will be given a reasonable opportunity to make a submission on the proposed discretionary condition.

3.10.3 Amendment provisions

Under the WM Act the FMP may be amended at any time, if it is in the public's best interest. The department keeps a record of any requests for amendment via an amendment register. Amendment of the FMP requires approval from the Minister for Water and concurrence from the Minister for the Environment.

Administrative amendments, that do not change the intent of existing rules or correct a typographical error, will generally not involve public consultation. Conversely, any amendment that may impact existing flood work approval holders or other landholders within the floodplain will involve a public consultation period including a formal submission process.

As required under the WM Act, part 9 of the FMP specifies the circumstances when an amendment may occur during the 10-year term. These include:

- amending any of the maps
- refining the management zones
- amending the design flood events used to map the floodway network
- refining the rules and assessment criteria.

The historical localised FMP required that any review should explore the capacity of the plan to adapt to address climate change impacts on flood risk exposure, flood-dependent ecosystems and rural economies. In response to this requirement, the department has committed to amending the FMP within the first 3 years (before 1 July 2029) to include rules and assessment criteria that consider the effects of climate change.

The department is currently working to collect and analyse information on predicted changes to flooding as a result of climate change, which will underpin any future changes to the FMP. Further public consultation will be undertaken before any rules are introduced in the FMP relating to climate change.

3.10.4 Existing and natural flooding regimes

Part 3 of the FMP identifies the existing and natural flooding regimes within the floodplain. This identification does not relate to any rule or assessment criteria but is required under the WM Act.

The natural flooding regime is characterised by flood events prior to any development on the floodplain while the existing flooding regime is characterised by changes in flooding following development on the floodplain.

The FMP has used the construction of the Hume and Dartmouth dams as the defining feature for development on the floodplain.

As required under the WM Act, the natural and existing flooding regimes are identified in terms of nature, frequency, duration and extent.

3.10.5 Benefits of flooding

Part 4 of the FMP identifies the benefits of flooding, both to the identified flood-dependent Aboriginal cultural assets and values and flood-dependent ecological assets within the floodplain. This identification does not relate to any rule or assessment criteria but is required under the WM Act.

To assist in enhancing the benefits of flooding to Aboriginal cultural assets, ecological assets and heritage sites that are flood-dependent, the FMP includes rules and assessment criteria that allow for the construction of flood enhancement works.

3.10.6 Existing flood works

Part 5 of the FMP identifies the types and extent of existing approved flood works within the floodplain. It also outlines the benefits in terms of the protection the flood works provide to life and property, and the cultural, socio-economic and ecological impacts of the flood works including the cumulative impacts. This part of the FMP does not relate to the rules or assessment criteria for flood works but is required under the WM Act.

There are approximately 341 flood work approvals covering 690 flood works within the floodplain for the following types of flood works:

- access roads
- infrastructure protection works
- levees
- stock refuges
- storages
- supply channels (above and below ground).

3.10.7 Risks from flooding

Part 6 of the FMP identifies the risks to life and property from the effects of flooding in the floodplain and clarifies how the FMP addresses these risks. This identification does not relate to any rule or assessment criteria but is required under the WM Act. The floodway network map contributes to this identification (see section 3.2).

The primary risks to life and property include:

- loss of life
- physical injury and illness
- damage to or loss of property, goods, possessions, livestock and crops
- financial costs
- emotional stress including mental illness
- restricted access to/from property.

The FMP considers the risk to life and property from the effects of flooding by identifying the floodway network including high risk areas (floodways), restricting the types of flood works permitted within high-risk areas and raising awareness of flood risk.

3.11 Interagency review

An interagency working group is responsible for reviewing draft FMPs on a whole-of-government basis and considers the advice provided by technical staff and comments received from stakeholders during public consultation. Key experts from the NSW Department of Primary Industries and Regional Development (agriculture and fisheries interests) and the NSW Department of Climate Change, Energy, the Environment and Water (Aboriginal, water and environmental interests) are represented on this interagency working group. Experts from the Natural Resources Access Regulator and WaterNSW may also attend meetings of the interagency working group to provide advice on consultation activities and other matters relevant to their expertise.

The interagency working group reviewed the preparation of the FMP at 3 key stages:

- prior to Stage 1 public consultation (April 2024)
- prior to Stage 2 public exhibition (March 2025)
- prior to the preparation of the final FMP for commencement (January 2026).

All feedback from consultation processes for the preparation of FMPs is reviewed by the interagency working group prior to updating the plan.

3.12 Consultation

Consultation for the development of the FMP was undertaken using a two-stage process:

Stage 1 public consultation (20 May to 30 June 2024)

Submissions were invited on key elements including the boundary, floodway network, floodplain assets and default plan rules. This included confirming and verifying property scale information,

which enabled the department to respond to stakeholder feedback and, where appropriate, make changes to the key elements prior to developing the draft FMP for public exhibition.

The comments received during initial public consultation were considered by the interagency working group before the draft FMP was prepared and released for public comment during Stage 2 public exhibition.

An overview of Stage 1 public consultation, the feedback received, and the department’s response is available in a [What we heard report for Stage 1 public consultation](#), published on the department’s website.

Stage 2 public exhibition (29 September to 16 November 2025)

The draft FMP was formally exhibited for 49 days. Online appointments with departmental staff were available for landholders and other stakeholders to find out more about the development of the draft management zones, the draft rules and how to make a submission.

An overview of Stage 2 public exhibition, the feedback received and the department’s response is available in a [What we heard report for Stage 2 public exhibition](#), published on the department’s website.

Feedback and submissions received during Stage 2 public exhibition were considered by the interagency working group before the final FMP was submitted to the Minister for Water for approval and the Minister for Environment for concurrence in early 2026.

Once concurrence was received from the Minister for the Environment, the FMP was returned to the Minister for Water for final approval. The FMP commenced on 1 July 2026 and was published on the [NSW legislation website](#).

4 Implementing the FMP

4.1 Implementation

While the department’s Water Group is responsible for the development of FMPs under the WM Act, responsibility for their implementation sits across multiple government departments and agencies. Table 5 provides an overview of these responsibilities.

Table 5: Summary of the government departments and agencies that are responsible for the implementation of the FMP

Department/agency	Responsibilities
WaterNSW	• Receive, assess and approve flood work applications • Supply data and information to external stakeholders/ customers to support the preparation of flood work applications • Notify mandatory conditions to existing approval holders

Department/agency	Responsibilities
Water Group	• The Licensing & Approvals team receive, assess and approve flood work applications from their customers • Provide plan interpretation advice to WaterNSW and Licensing & Approvals to assist with flood work approval assessments • Update models and spatial data based on new flood works in the landscape to enable a cumulative assessment to be undertaken by WaterNSW and Licensing & Approvals • Management of data products, supply of data products to WaterNSW and Licensing & Approvals to support flood work approvals • Periodically review and amend FMPs within the provisions of the WM Act • Maintain amendment register • Consulted as part of the audit of FMPs by the Natural Resources Commission • Develop and apply mandatory conditions for flood work approvals
Natural Resources Access Regulator (NRAR)	• Conduct compliance activities on flood work approvals
Natural Resources Commission (NRC)	• Audit FMPs under section 44 of the WM Act
Local government	• Integrated development applications can consider FMPs but don't require a flood work approval
NSW Department of Planning	• Integrated development applications can consider FMPs but don't require a flood work approval

4.2 Monitoring, evaluation and reporting

To demonstrate whether the objectives of the FMP are being achieved, the department will undertake monitoring, evaluation and reporting which will assess key performance indicators. The monitoring and evaluation will use multiple lines of evidence. It will involve assessment of all new flood works and will include:

- hydraulic assessment with updated hydraulic models to examine any predicted changes to flooding behaviour and if there are any potential impacts to other property, ecological and cultural assets

- hydrological and spatial assessment of flood events that occurred in the 10-year term of the FMP to determine if there are any major obstructions or changes to inundation extent and compare/validate hydraulic modelling where applicable
- use of modelling and flood data to assess floodway network connectivity, the passage of floodwater in the floodplain and connectivity to ecological and cultural assets
- identification of any changes to the management zones or rules that could further facilitate the FMP in meeting its key objectives.

Within the first 5 years of the 10-year term of the FMP, the Natural Resources Commission will also undertake an audit to determine whether the provisions are being given effect. This includes the objectives, strategies and performance indicators.

5 Appendices

5.1 Appendix 1 Development of the floodway network

Computer-based hydraulic models are used to simulate the movement of floodwater across the landscape for the large and small design floods. Modelling data, along with additional information such as flood imagery and topographical information, is used to map the floodway network. This appendix describes the design floods and the hydrologic and hydraulic modelling that has been used to develop the floodway network for the floodplain.

5.1.1 Design floods

A design flood is a flood of known magnitude or annual exceedance probability (AEP) that can be modelled. A design flood forms the basis of the floodway network, and this information is used as the hydraulic basis when developing the management zones in an FMP. Selection of a design flood is based on an understanding of flood behaviour and associated flood risk. Multiple design floods may be selected to account for the social, economic and ecological consequences associated with floods of different magnitudes.

Two design floods were selected for the floodplain:

- large design flood – August to December 2022 (2.5% AEP at the Murray River at Barham gauge)
- small design flood – September to December 2016 (16% AEP at the Murray River at Barham gauge).

AEP is the chance of a flood of a given or larger size occurring in any given year, usually expressed as a percentage (%) or a likelihood of 1 flood in x years. For example, a flood with an AEP of 5% means there is a 5% chance that a flood of the same size or larger will occur in any given year.

A flood frequency analysis was done to assist with the selection of the design floods, shown in Table 6. Flood frequency analysis was used to determine the relationship between peak flood discharge at a location of interest and the likelihood that a flood event of that size or greater would occur.

Table 6: AEP for historic flood events at selected locations in the NSW Murray Valley Floodplain

Location (gauge number)	1974 flood event AEP (%)	2010 flood event AEP (%)	2012 flood event AEP (%)	2016 flood event AEP (%)	2022 flood event AEP (%)
Edward River at Deniliquin (409003)	5.3	11.0	10.0	13.0	3.3
Edward river at Moulamein (409014)	2.5	9.1	13.0	14.6	6.0

Location (gauge number)	1974 flood event AEP (%)	2010 flood event AEP (%)	2012 flood event AEP (%)	2016 flood event AEP (%)	2022 flood event AEP (%)
Murray River at Tocumwal (409202)	3.3	3.2	4.0	11.0	0.5
Goulburn River at Shepparton (405204)	2.2	35.7	4.0	15.8	9.1
Campaspe River at Rochester (406202)	1.3	31.0	15.0	8.3	Not available
Murray River at Barham (409005)	2.5	16.9	8.3	18.9	5.5
Murray River at Swan Hill (409204)	11.0	36.0	1.7	12.0	0.7

The large design flood (August to December 2022) was used to delineate floodways with significant discharge and to determine the extent of the floodway network. The large design flood was selected as:

- it is a recent large flood and is likely to be in the collective memory of floodplain communities
- it is representative of large floods in the Murray Valley Floodplain
- there is a significant amount of information available for the event.

The large design flood is a 2.5% AEP flood event at the Murray River at Barham gauge. A review of other historical events found that all other options for the large design event were limited by the available data or their suitability in terms of their size (return period). While it is acknowledged that the 2022 floods had considerable local rainfall-runoff, the modelling (and plan) focus is on the riverine flooding.

The small design flood (September to December 2016) is a 16% AEP flood event at the Murray River at Barham gauge. This smaller event was selected to identify critical flow paths in the floodway network, where the modelled inundation extent of this event is compared to the identified floodways to ensure the accuracy of the network.

5.1.2 Hydraulic modelling

The Murray floodplain was divided into 5 reaches for hydraulic modelling purposes. These reaches are described in Table 7 and shown in Figure 3.

A suite of advanced one-dimensional (1D) and two-dimensional (2D) computer simulation software for hydraulic modelling of flood behaviour in rural and urban settings, known as TUFLOW, was used for each of the 5 reaches. The study area was modelled in the 2D domain with key structures, such

as culverts, incorporated as 1D elements. Successful calibration and validation of the hydraulic models enabled the replication of historical flood events, including design flood events, with an acceptable degree of accuracy.

To define acceptable degrees of accuracy, a hydraulic modelling standard specification was developed. It stipulates that all models must be within 200 mm of the inundation depth (based on gauge data and spot elevations) and 5% of the inundation width (based on aerial photography and satellite imagery).

5.1.2.1 Hydraulic model data and parameters

Hydraulic models have several parameters that need to be calibrated to correctly represent how floodwater behaves across the floodplain. The choice of values for these parameters can significantly affect the accuracy of the model outputs and lead to incorrect delineation of the floodway network. Some of these parameters include:

- **Hydrometric and hydrologic model data:** Recorded (gauged) hydrograph data was used as boundary inflows for the hydraulic models.
- **Boundary conditions:** Each model identifies the inflow conditions at the upstream start of the project area and outflow conditions at the downstream finish of the project area.

Representing inflows is critical to ensure the model has appropriate volumes and flow rates within the study area. Similarly, at the downstream boundary, water needs to be removed from the model at the correct rates to avoid artificially increasing or decreasing flooding.
- **Topographic information:** A digital elevation model of the existing floodplain topography was developed using a range of topographic datasets acquired from available bathymetry, river cross sectional surveys and Light Detection and Ranging (LiDAR) laser surveying.
- **Grid size:** The model grid size, which is the spatial distance between calculation points, can have a significant impact on the accuracy of results. In particular, if areas with a high variation in topography are represented too coarsely, the flow distribution between different flow paths will be impacted. Grid sizes used in the hydraulic models for the floodplain are presented in Table 7.
- **Hydraulic structures:** All bridges, culverts, weirs, and regulators likely to impact flow along key watercourses and across adjoining floodplain areas were also included in the models as either 1D or 2D structures. In general, structures that were less than the model grid cell size wide (for example, smaller floodplain culverts) were represented as 1D structures.

It is important that all structures on the floodplain are represented in the model with a high level of accuracy. If structures are not represented correctly, they will behave differently. For example, water may overtop a levee sooner in the model than it does in reality, or water may be constricted by a bridge to a greater degree in the model than in reality.

Data for all significant structures in the model area were captured by ground survey in previous studies (for example, Sustainable Diversion Limit Adjustment Mechanism (SDLAM) projects and The Living Murray) and many remaining structures were measured during field inspections.

- **Existing hydraulic models:** Specific information such as surveyed topographical data and hydraulic structures information from previous developed hydraulic models within the study area were extracted and used in the hydraulic models developed for the NSW Murray Valley Floodplain.

- **Land use / vegetation:** Available land use and vegetation layers covering the study area were used to inform the “roughness” of the ground surface. Floodwater moves more slowly through dense vegetation compared to a cleared field. As part of the calibration process, flood observations, such as gauge data, satellite imagery, flood images, or footage, are compared to the model results, and the parameters, like roughness, are modified if the model is not aligning with the observed information.
- **Satellite imagery - Sentinel and Landsat:** Available satellite (Sentinel and Landsat 8) imagery of various dates during selected flood events were used for hydraulic model calibration and validation.
- **Data collected during previous flood events:** Flood information such as local flood levels, flow directions, flood extents and inundation duration collected during previous community consultation has been used for hydraulic model calibration and validation. Throughout June, July and August 2023, landholders and local councils provided a range of data including ground and aerial flood level imagery and identification of areas where flood flow connectivity was compromised. To date, the department has collected an abundance of flood images, some drone footage and a significant number of verbal accounts of the 2022 flood event across all four valleys. The 2022 flood event was selected as the large design flood. There was also an abundance of historical flood information provided such as historical flood photos and descriptions of floodplain behaviour during past events from the 1950s to 2022.
- **Existing flood works:** A range of natural and constructed embankments extending across the floodplain, such as levees, rail, and road embankments, were included in the hydraulic models. Each of these features can have a significant impact on the movement of floodwater. Some of these flood works do not have a flood work approval.

The process to determine how unapproved flood works should be considered in the development of the floodway network is shown in Figure 4. This process considers the potential flooding impacts of the unapproved work, whether the impact is contained within the landholding or if it impacts other neighbouring properties and whether the impacted area is recognised as a floodway within the historical planning arrangements. A summary of the historical planning arrangements in the floodplain is provided in Appendix 4 Comparison with historical planning arrangements.

Unapproved flood works are a significant issue for many local landholders. To report concerns regarding unapproved works, please visit the NRAR website at nrar.nsw.gov.au/report-suspicious-water-activities.

You can also contact NRAR on 1800 633 362 during business hours or via email nrar.enquiries@nrar.nsw.gov.au.

Table 7: Hydraulic models in each reach of the NSW Murray Valley Floodplain

Floodplain model reach	Model grid cell size	Model description
Murray Valley – Tuppall and Bullatale Creeks	40 m for dry and floodplain areas and 10 m for waterways and hydraulic controls	A TUFLOW 1D/2D grid model was built from upstream of the Newell Highway and railway bridge at Tocumwal to downstream of the Barmah Road bridge at Barmah. The downstream extent of the model on the Edward River is located at Deniliquin. The other major features within this reach include Bullatale Creek, Tuppall Creek, Gulpa Creek, Native Dog Creek, Toupna Creek, Ulupna Creek, Aratula Creek, Warrick Creek, Broken Creek, Coolamon Creek, Four Post Creek, Barmah Creek and Tongalong Creek.
Murray River – from Barham to Barham	40 m for dry and floodplain areas and 10 m for waterways and hydraulic controls	A TUFLOW 1D/2D grid model was built from Barmah Road Bridge at Barmah to downstream of the Thule Street bridge at Barham. The other major features within this reach are Gunbower Creek, Benarca Waterholes, Goulburn River, Crooked Creek, Burrumbury Creek, Barbers Creek, Broken Axle Creek, Belbins Creek, Upper Gunbower Creek, Deep Creek, Myloc Creek, Barbers Creek Backwater, Little Burrumbury Creek, Warrigal Creek, Bullock Head Creek, Campaspe River, Thule Creek and Backwater Creek.
Wakool River – from Deniliquin to Kyalite	40 m for dry and floodplain areas and 10 m for waterways and hydraulic controls	A TUFLOW 1D/2D grid model was built from upstream of Thule Street bridge on Murray River at Barham to the downstream of Swan Hill Road bridge at Swan Hill. The upstream extent of the model on the Edward River is located upstream of National Bridge at Deniliquin. The downstream extent of the model on the Wakool River is located downstream of Swan Hill Road. The other major features within this reach include Merran Creek, Little Murray River, Yallakool Creek, Wyam Creek, Barbers Creek, Yarrein Creek, Bullockhide Creek Eagle Creek, Coobool Creek, Colligen Creek, Mulligans Creek, Cockrans Creek, Back Creek, Porthole Creek, Bunna Creek, Merangatuk Creek, Merribit Creek, Mallan Mallan Creek, Cunninyeuk Creek and Waddy Creek.

Floodplain model reach	Model grid cell size	Model description
Edward River – from Deniliquin to Kyalite	40 m for dry and floodplain areas and 10 m for waterways and hydraulic controls	A TUFLOW 1D/2D grid model was built from upstream of Davidson Street bridge at Deniliquin to before Edward River convergence with the Wakool River. The downstream extent of the model on the Niemur River is at upstream of Cunninyeuk Road bridge before its convergence with the Wakool River. The other major features within this reach include Yarrein Creek, Cockrans Creek, Colligen Creek, Murrain Yarrein Creek, Jimaringle Creek, Jawbone Creek, Gwynnes Creek, Swampy Creek, Booronong Creek, Middle Creek, Berambong Creek, Papanue Creek, Kangaroo Creek, Burragorrima Creek and Tumudgery Creek.
Murray River – from Swan Hill to Boundary Bend	40 m for dry and floodplain areas and 10 m for waterways and hydraulic controls	A TUFLOW 1D/2D grid model was built along Murray River from downstream of Murray River Road Bridge at Swan Hill to downstream of Murray Valley Highway bridge at Robinvale. The upstream extent of the model on the Murrumbidgee River is located approximately 10 km downstream of Balranald, at Balranald Weir. The upstream extent of the model on the Wakool River is located at Kyalite. The other major features within this reach are Manie Creek, Burra Creek, Wee Wee Creek, Speewa Creek, Peacock Creek, Narcooyia Creek, Jack O'Brien's Creek, Taila Creek, Caringay Creek and Waldaira Creek.

Figure 3: The five reaches of the hydraulic models within the NSW Murray Valley Floodplain

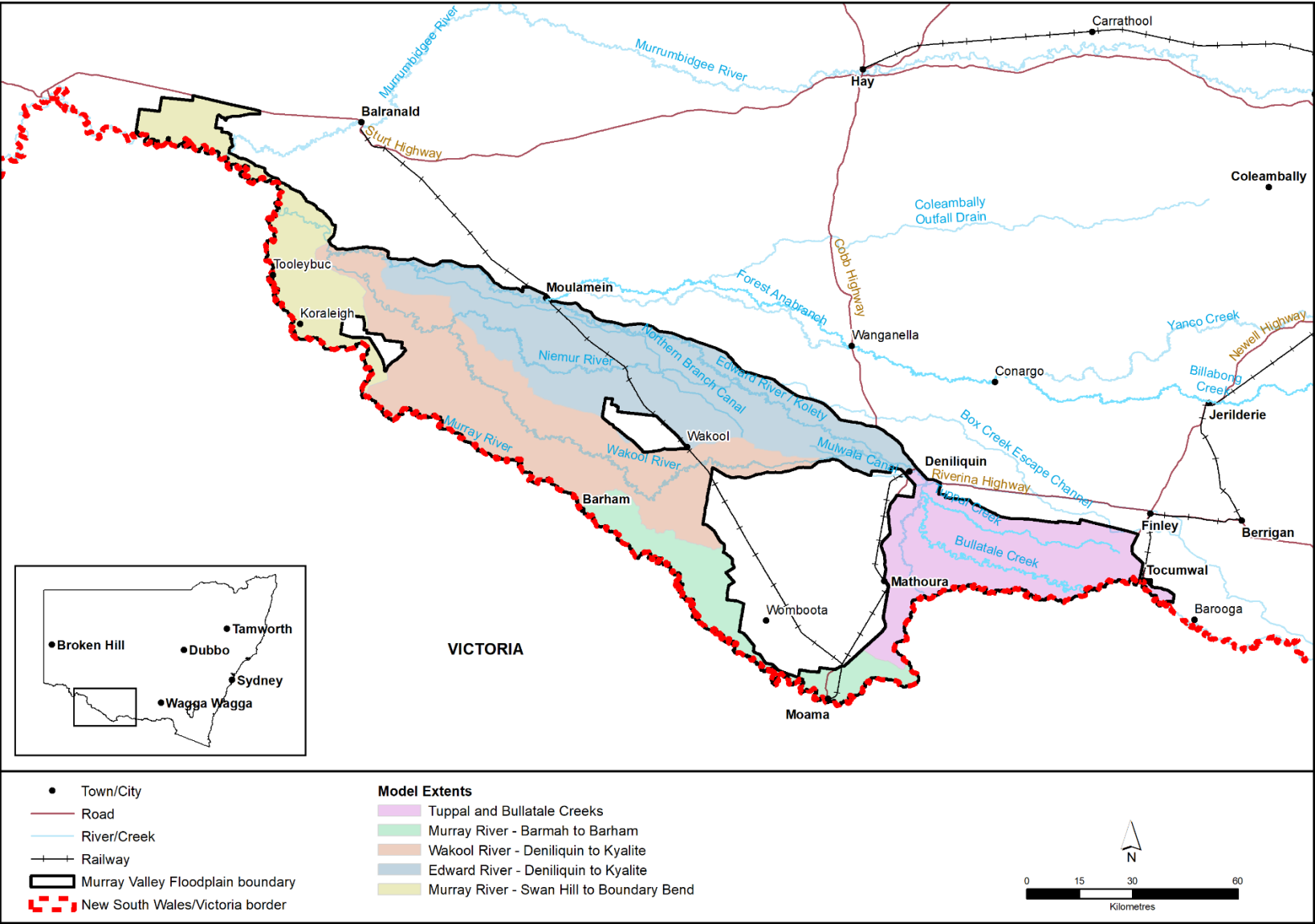
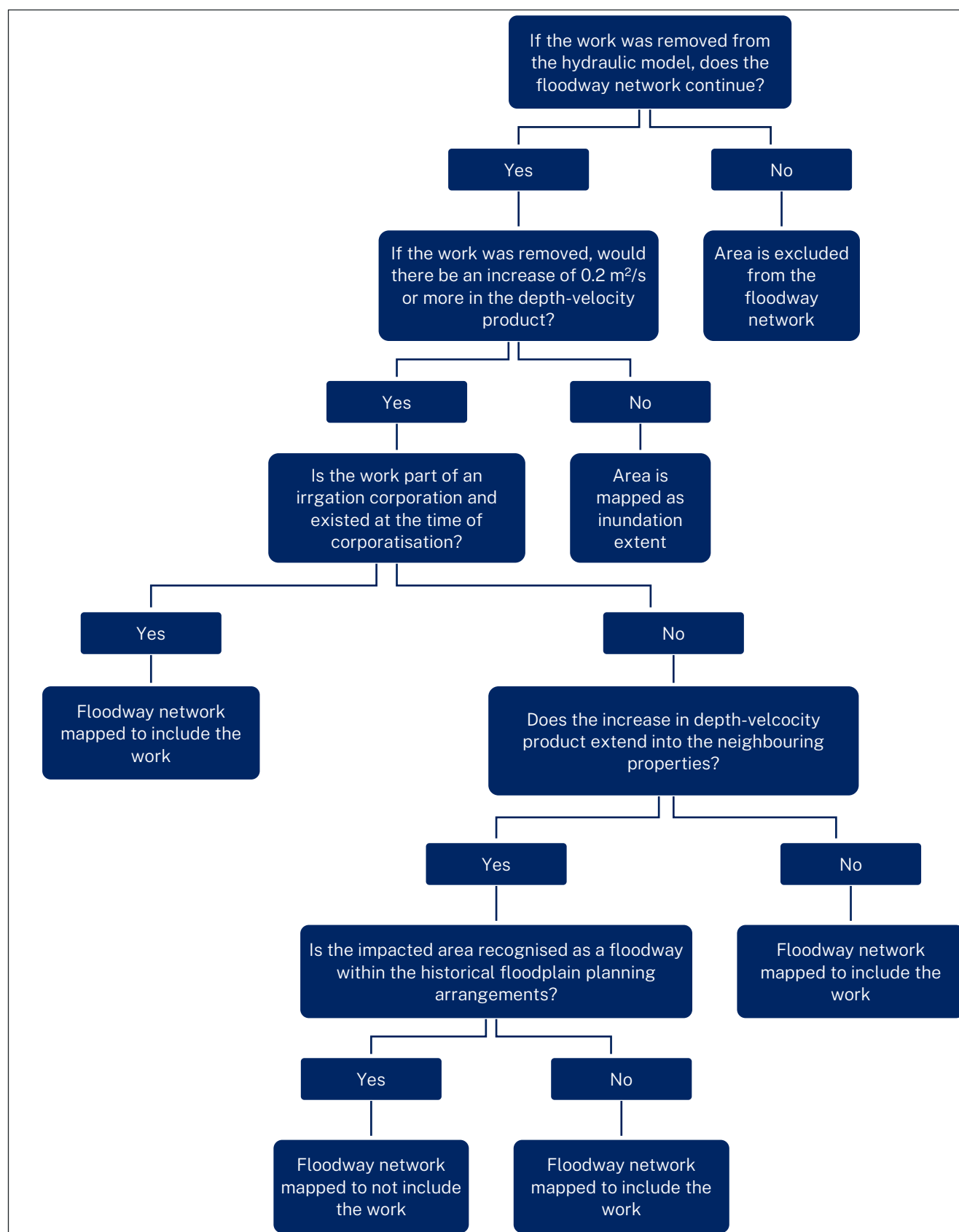


Figure 4: Process for determining if an unapproved work should be considered in the development of the floodway network



5.1.3 Hydrologic modelling

Flood flow data at various points across the floodplain are a key input to the hydraulic models that used to map the floodway network. Within the NSW Murray Valley Floodplain, flood flows were derived from mainstream and tributary streamflow gauges, while flows for ungauged tributaries were estimated using hydrologic information from adjacent catchments with an appropriate rate as determined by aerial imagery captured during each event.

Data from the following streamflow gauges (Table 5) was available for the development of the hydraulic models. More information about these streamflow gauges is available on the [Water Insights website](#).

Table 8: Streamflow gauges used in the development of the hydraulic models for the Murray Valley Floodplain

Gauge number	Location
409202	Murray River at Tocumwal
409711	Murray Valley Drain 3 outfall at Sheepwash Creek
404210	Broken Creek at Rices Weir
409215	Murray River at Barmah
405277	Yambuna Drain Outfall
405232	Murray River at McCoys Bridge
406265	Campaspe River at Echuca
409056	Tuppall Creek at Aratula Road
405204	Goulburn River at Shepperton
406202	Campaspe River at Rochester
409005	Murray River at Barham
406263	Mullers Creek at Murray Valley Highway
409003	Edward River at Deniliquin
409013	Wakool River at Stoney Crossing
408213	Avoca River at Outfall (Tresco Pumphouse)

Gauge number	Location
409058	Box Creek at Conargo Road
409204	Murray River at Swan Hill
409109	Thule Creek at Lower Thule Road
409113	Barbers Creek at Barbers Pool
407202	Loddon River at Kerang
409086	Niemur River at Mallan School
409014	Edward River at Moulamein
410134	Billabong Creek at Darlot
409035	Edward River at Liewah
409013	Wakool River at Stoney Crossing
410130	Murrumbidgee River at D/S Balranald Weir
414200	Murray River at Below Wakool Junction
414203	Murray River at Euston

5.1.4 Hydraulic model calibration and validation

The hydraulic models were calibrated and validated using selected historic flood events that are around the design flood magnitude and are likely to activate all flood flow paths.

The flood events below were used for calibration and validation.

Table 9: The selected flood events that were used to calibrate and validate the hydraulic models

Floodplain model reach	Large calibration Event	Small calibration Event	Validation Event
Murray Valley - Tuppall and Bullatale Creeks	August to December 2022 flood	September to December 1996 flood	September to November 2016 flood

Floodplain model reach	Large calibration Event	Small calibration Event	Validation Event
Murray River - from Barmah to Barham	August to December 2022 flood	September to December 2016 flood	September to November 1993 flood
Wakool River - from Deniliquin to Kyalite	August to December 2022 flood	September to December 2016 flood	September to December 1993 flood
Edward River - from Deniliquin to Kyalite	August to December 2022 flood	September to December 2016 flood	September to December 1993 flood
Murray River - Swan Hill to Boundary Bend	August 2022 to January 2023 flood	July 2016 to January 2017 flood	July 1993 to January 1994 flood

The models were calibrated against a range of data sources, particularly:

- peak flood heights at streamflow gauge locations
- available flow distribution calculations for the existing non-statutory floodplain development guidelines
- the peak discharge magnitude and timing at streamflow gauge locations
- flood extents from satellite imagery and aerial photography.

A summary of the peak recorded flows and water levels during the selected flood events for calibration and validation of the hydraulic models is presented in Table 10.

Table 10: Peak recorded flows and water levels during selected flood events for calibration and validation of hydraulic models

Gauge	2016 flood water level (mAHD*)	2016 flood flow (ML/day)	2022 flood water level (mAHD)	2012 flood flow (ML/day)
Murray River at Tocumwal (409202)	6.85	165,000	7.32	165,600
Murray River at Barmah (409215)	6.85	Not available	7.32	Not available

Gauge	2016 flood water level (mAHD*)	2016 flood flow (ML/day)	2022 flood water level (mAHD)	2012 flood flow (ML/day)
KPF Offtake downstream Regulator (409114)	2.39	Not available	2.99	Not available
Murray River at Barham (409005)	6.08	31,100	6.21	36,406
Murray River at Swan Hill (409204)	4.30	27,203	4.60	30,075
Murray River at Below Wakool Junction (414200)	11.01	107,692	11.72	154,000
Tuppall Creek at Aratula Road (409056)	8.26	38,944	8.16	37,415
Wakool River at Coonamit Bridge (409061)	10.99	62,564	12.41	111,204
Wakool River at Stoney Crossing (409013)	9.30	66,944	10.86	133,592
Edward River at Deniliquin (409003)	8.62	76,416	9.19	102,958
Edward River downstream Stevens Weir (409023)	6.51	Not available	6.57	Not available
Edward River at Moulamein (409014)	5.76	17,169	6.23	26,253
Edward River at Liewah (409035)	7.12	16,490	8.25	25,492

*mAHD means elevation in metres with respect to the Australian height datum.

5.1.5 Hydraulic model outputs

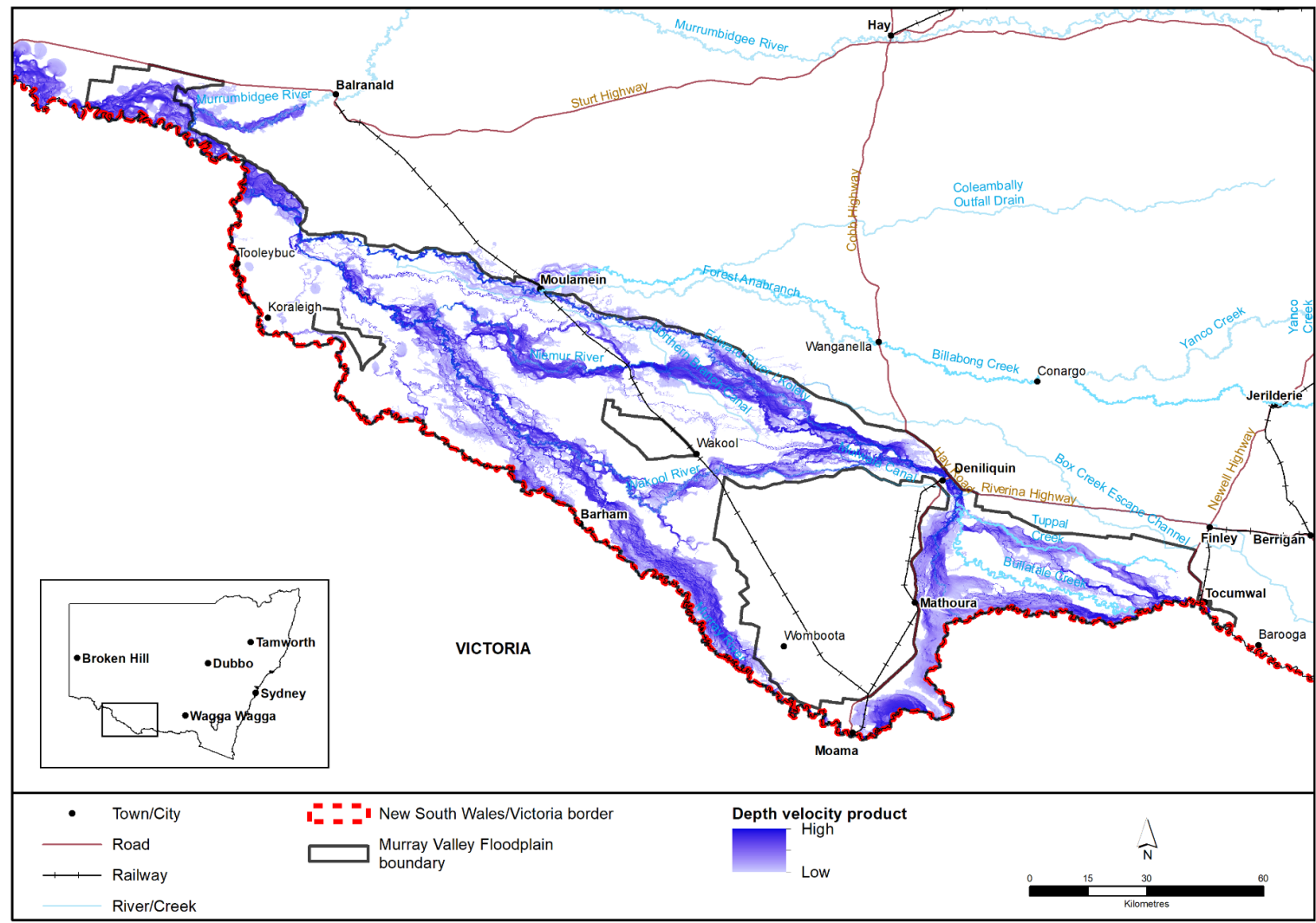
The hydraulic model outputs used to develop the floodway network included:

- depth-velocity product maps for the large design flood (see Figure 5).
- inundation extents for the small design flood and the large design flood.

A depth-velocity product is derived by multiplying the modelled depth and velocity results at each calculation point. This is used to indicate areas of high flow (deep and fast flowing) throughout the floodplain.

These outputs were used to determine the appropriate size of each floodway and the overall floodway network. In areas where hydraulic data was not sufficient to accurately map the flood extents, the limits to the floodway networks were determined by using aerial and satellite flood imagery captured for the design flood event.

Figure 5: Hydraulic modelling results (depth-velocity product) map from all five models for the large design flood event (March 2022 – 2.5% AEP at the Murray River at Barham gauge)



5.1.6 Mapping the floodway network

5.1.6.1 Hydraulic criteria

The small and large design floods provide the hydraulic basis for delineating the floodway network. The hydraulic criteria that were used to delineate the floodway network are described in Table 11.

Table 11: Summary of the criteria used to delineate the hydraulic categories in the floodway network

Hydraulic category	Criteria
Floodways	• Areas that have a depth-velocity product (DVP) of greater than or equal to 0.2m²/s for the large design flood. • Areas that support tributary flows and outer floodplain floodways that have a DVP of greater than or equal to 0.15 m²/s for the large design flood. • Parts of the small design flood extent that ensure continuity of floodways.
Inundation extent	• Flood extent of the small design flood and the large design flood. • In areas outside the hydraulic model extent flood imagery from the 2022 flood event derived from Sentinel and Landsat imagery.
Areas outside of the floodway network	• Flood fringe areas outside the large design flood extent. • Floodplain area enclosed by existing flood works that were not designed to be overtopped by floodwater.

Hydraulic modelling outputs may not always account for all the important floodways. As such, additional data is used to ensure that the floodway network represents on-ground conditions. The following information was used to validate the floodway network:

- flood aerial photography and satellite imagery
- spatial watercourse layers
- non-statutory rural floodplain development guidelines
- local knowledge from floodplain communities, and floodplain and environmental managers
- existing flood work development.

5.1.6.2 Floodways

Floodways in the NSW Murray Valley Floodplain were mapped using the outputs of the hydraulic models, in particular the DVPs from the large design flood (August to December 2022).

Floodways derived from the target depth-velocity threshold were compared with the inundation extent of the small design flood (September to December 2016). This comparison was undertaken to ensure that areas of the floodplain activated during small floods were identified as floodways, irrespective of whether they reached the selected depth-velocity threshold. Such areas are also

likely to be the first floodways activated during large flood events and may be important for connecting flood-dependent ecological and cultural assets to floodwater during smaller floods.

5.1.6.3 Inundation extent

The hydraulic modelling also produced the inundation extent of the large design flood (August to December 2022) across the floodplain. Where the flood extent was reliable via confirmation with observed data, its outer limits were used to determine the extent of the floodway network.

Areas within the extent of the large design flood are considered important for providing temporary pondage during large floods. Areas beyond the extent of the design flood may also be flood-prone but would only become inundated during larger floods including extreme events and would generally have low conveyance or pondage capacity.

5.2 Appendix 2 Ecological asset identification and categorisation

Two types of flood-dependent ecological assets have been identified in the NSW Murray Valley Floodplain: **wetlands** and **other flood-dependent ecosystems**.

Wetlands and other flood-dependent ecosystems include the vegetation communities that were identified and categorised according to the surface water requirements of the dominant or canopy species in the floodplain vegetation community, including:

- semi-permanent (non-woody) wetlands
- floodplain wetland (flood-dependent shrubland wetlands)
- flood-dependent forest / woodland (wetlands)
- flood-dependent woodlands.

Where an ecological asset is located outside of the floodway network, it is assumed to not be entirely flood-dependent. These areas are referred to as **other floodplain ecosystems**.

5.2.1 Ecological asset type - wetlands

Vegetation mapping including the [State Vegetation Type Map](#)⁶ of plant community types (PCTs) and several wetland studies were predominantly used to identify wetlands. PCTs identify recurring patterns of native plant species assemblages in relation to environmental conditions. More information about [NSW plant community type classification](#) is available on the department's website.

The following previous wetland studies and datasets have been identified:

- Directory of Important Wetlands in Australia⁷
- River Murray Wetlands Database⁸
- Wetlands of the River Murray⁹
- NSW Hydro Area dataset which contains delineations of named wetlands

⁶ Department of Planning and Environment (DPE) (2022) NSW State Vegetation Type Map. Current Release C1.1.M1.1 (December 2022)

⁷ Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2016) [Directory of Important Wetlands in Australia](#)

⁸ NSW Murray Wetlands Working Group (2006) River Murray Wetland Database: NSW, Victoria, NSW Murray Wetlands Working Group, Albury

⁹ Pressey RL (1986) Wetlands of the River Murray below Lake Hume, prepared for the River Murray Commission, Canberra

- Mitchell Landscapes version 3.1 which identifies Murray Lakes, Swamps and Lunettes¹⁰.

The following wetland areas are of international importance and are listed as Ramsar sites under the Ramsar Convention in 1999: NSW Central Murray Forests Ramsar site, specifically:

- Koondrook Forest Group
- Millewa Forest Group
- Werai Forest Group.

These sites are also listed in the Directory of Important Wetlands in Australia as follows:

- Koondrook and Perricoota Forests (NSW046)
- Millewa Forest (NSW053)
- Werai Forest (NSW056).

Wetlands within the NSW Murray Valley Floodplain include semi-permanent (non-woody) wetlands and floodplain (flood-dependent shrubland) wetlands.

Lignum swamps are a priority for the NSW and Commonwealth Governments, outlined in Murray–Lower Darling Long Term Water Plan^{11,12} and the Basin-wide environmental watering strategy¹³.

5.2.2 Ecological asset type – other floodplain ecosystems

River Red Gum is a target ecological population and noted environmental objective of the Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016, and is a priority for the NSW and Commonwealth Governments, outlined in the Murray–Lower Darling Long Term Water Plan^{11,12} and the Basin-wide environmental watering strategy¹³.

5.2.3 Plant community types and their watering requirements

The plant community types (PCTs) that make up the wetlands and other flood-dependent ecosystems on the floodplain, and their watering requirements are shown in Table 12 and Table 13.

¹⁰ Department of Environment and Climate Change (DECC) (2002) Descriptions for NSW (Mitchell) Landscapes Version 2 (2002)

¹¹ Department of Planning, Industry and Environment (DPIE) (2020a) Murray–Lower Darling Long Term Water Plan. Part A: Murray–Lower Darling catchment. ISBN 978-1-922317-81-0 EES 2020/0080 September 2020

¹² Department of Planning, Industry and Environment (DPIE) (2020b) Murray–Lower Darling Long Term Water Plan. Part B: Murray–Lower Darling planning units. ISBN 978-1-922317-80-3 EES 2020/0081 September 2020

¹³ Murray-Darling Basin Authority (MDBA) (2019) Basin-wide environmental watering strategy. Second Edition. 22 November 2019. Published by the Murray-Darling Basin Authority. MDBA publication no: 42/19. ISBN (online): 978-1-925762-47-1

Table 12: Wetland plant community types in the NSW Murray Valley Floodplain and their watering requirements

Wetlands by sub-type	Plant community type name (ID)	Ideal watering frequency (average recurrence interval) *
Semi-permanent (non-woody) wetlands	• Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 12) • Swamp grassland wetland of the Riverine Plain (PCT 47) • Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains (PCT 53) • Common Reed - Bushy Groundsel aquatic tall reedland grassland wetland of inland river systems (PCT 181) • Cumbungi rushland wetland of shallow semi-permanent water bodies and inland watercourses (PCT 182) • Permanent and semi-permanent freshwater lakes wetland of the inland slopes and plains (PCT 238)	1 in 1–2 years
Floodplain wetland (flood-dependent shrubland) wetland	Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 17)	1 in 1–3 years to 1 in 7–10 years
Floodplain wetland (flood-dependent shrubland) wetland	Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains (PCT 24)	1 in 2–3 years to 1 in 5–7 years
Floodplain wetland (flood-dependent shrubland) wetland	Nitre Goosefoot shrubland wetland on clays of the inland floodplains (PCT 160)	1 in 1–2 years to 1 in 2–7 years

*Refers to the frequency at which a flow event is required to maintain the ecological character of the wetland, expressed as an average recurrence interval (the long-term average number of years between a flood event). Adapted from the Murray-Lower Darling Long Term Water Plan.

Table 13. Other floodplain ecosystems – Plant community types in the NSW Murray Valley Floodplain and their watering requirements

Other floodplain ecosystems by sub-type	Plant community type name (ID)	Ideal watering frequency (average recurrence interval) *
Flood-dependent forest/woodland (wetland)	• River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW (PCT 2) • River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5) • River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion (PCT 7) • River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 11)	1 in 1–3 years
Flood-dependent forest/woodland (wetland)	• River Red Gum - Warrego Grass - Couch Grass riparian tall woodland wetland of the semi-arid (warm) climate zone (Riverina Bioregion and Murray Darling Depression Bioregion; PCT 8) • River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion (PCT 9) • River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 10) • Yellow Box – River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion (PCT 74)	1 in 2–4 years

Other floodplain ecosystems by sub-type	Plant community type name (ID)	Ideal watering frequency (average recurrence interval) *
Flood-dependent woodlands	• Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 13) • Black Box grassy open woodland wetland of rarely flooded depressions in southwestern NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 16) • Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in southwestern NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 15) • Buloke - Moonah - Black Box open woodland on sandy rises of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion; PCT 20)	1 in 3–7 years to 1 in 5–10 years

*Refers to the frequency at which a flow event is required to maintain the ecological character of the wetland, expressed as an average recurrence interval (the long-term average number of years between a flood event). Adapted from the Murray-Lower Darling Long Term Water Plan.

5.2.4 Consideration of water-dependent fauna and habitat in the identification of the flood-dependent ecological assets

The identification of the flood-dependent ecological assets within the NSW Murray Valley Floodplain includes consideration of key habitat features for water-dependent fauna including areas of native fish passage¹⁴, observed waterbird breeding habitat sites and drought refugia. The management zones and associated rules aim to provide for the adequate passage of floodwater to these areas to maintain their ecological value.

¹⁴ Fish passage refers to connectivity that allows native fish species to move between upstream and downstream habitats as well as adjacent riparian and floodplain areas. Areas of key fish habitat include rivers, creeks and flood flow paths and are available on the [Fisheries Spatial Data Portal](#).

5.3 Appendix 3 Management zone classification

This section provides a more detailed explanation of the application of the management zone classification tool as described at section 3.7.1 Management zones.

The department sought feedback on the proposed management zones, particularly at a property scale, during Stage 2 public exhibition. In response to feedback received during public exhibition, the department made multiple refinements to the spatial extent of the management zones prior to the commencement of the FMP. These refinements are shown on the maps in Appendix 2 of the [What we heard report for Stage 2 public exhibition](#).

5.3.1 Floodway network (management zone A and B)

The floodway network was presented as part of Stage 1 public consultation. It has been defined by:

- mapping the outputs of the hydraulic modelling
- considering the floodway networks in the existing localised FMP and historical floodplain development guidelines, and aligning with them where appropriate
- reviewing additional flood photography and satellite imagery.

In response to feedback received in Stage 1 public consultation, multiple refinements were made to the floodway network. These refinements can be seen in Appendix 2 of the [What we heard report for Stage 1 public consultation](#).

The floodway network is comprised of floodways and the inundation extent (ponding areas).

For more information on the development of the floodway network, please refer to Appendix 1 Development of the floodway network.

5.3.1.1 Floodways (management zone A)

Floodways are areas of fast-flowing floodwater during times of flood. These areas are identified by a modelled depth velocity product of at least 0.2 m²/s for the large design flood, and at least 0.15 m²/s in areas that support tributary flows and outer floodplain floodways.

Floodways are high-risk areas that, even if only partially blocked, would cause significant changes in the movement of floodwater across the floodplain.

It is a critical area of the floodplain as it allows water to leave or return to a river or creek during times of flood or deliver floodwater to ecological assets and Aboriginal cultural values that depend on it. Floodways also pose the greatest risk to life and property during times of flood.

All floodways have been assigned management zone A.

5.3.1.2 Inundation extent (management zone B)

The inundation extent is the area where floodwater breaks out (flood discharge) and forms ponds. It is identified by the modelled flood extent of the large design flood and small design flood, plus any flooded areas identified through Sentinel and Landsat imagery during the August to December 2022 flood event.

These areas are critical to storing floodwater during times of flood. Without these areas, the depth and speed of the floodwater in the floodway would dramatically increase. It is important that flood works constructed in these areas are coordinated so that they do not block inundation, particularly during large floods.

All the inundation extent has been assigned management zone B.

5.3.2 Identified Aboriginal cultural assets and values

Aboriginal cultural assets and values on the floodplain can be:

- flood-dependent, such as waterholes, fish traps or scarred trees that require inundation
- flood-impacted, such as Aboriginal burial grounds or shell middens that can be damaged by scour and erosion caused by flooding or directly during the construction of a flood work.

As part of assessing and determining an application for a flood work approval, a search of the Aboriginal Heritage Information Management System (AHIMS) must be conducted. AHIMS is a secure electronic database that holds over 100,000 records and information about Aboriginal Places, objects, and other significant sites across NSW. Due to cultural sensitivities, the Aboriginal cultural assets in the floodplain are not shown on a map in the FMP.

To ensure that Aboriginal cultural assets and values are protected from impacts associated with flood works, the department has been explaining and promoting the use of AHIMS as part of consultation with Aboriginal communities.

As part of assigning management zones, the department has identified all flood-dependent Aboriginal cultural assets within the floodplain that are recorded on AHIMS. It is these assets which require consideration in assigning management zones to ensure that the flow of floodwater is maintained.

5.3.2.1 Aboriginal cultural assets within or near a floodway (management zone A)

Where a flood-dependent Aboriginal cultural asset is located within or near a floodway, it has been assigned management zone A. Where the flood-dependent Aboriginal cultural asset is located near a floodway, the area is connected to the floodway with a management zone A connector. More information on connectors is provided in section 5.3.5.

Some examples of flood-dependent Aboriginal cultural assets assigned as management zone A include scarred river red gum trees and waterholes.

There may also be some flood-impacted Aboriginal cultural assets located within a floodway. These areas have also been assigned management zone A as they already form part of the floodway network, as explained in section 5.3.1. There are rules that allow for Aboriginal cultural protection works to be constructed to protect these areas from the impacts of flooding. Please refer to the rules for management zone A in section 3.7.2.1 for more information.

5.3.2.2 Aboriginal cultural assets not near a floodway (management zone B, C and CU)

Where an Aboriginal cultural asset is located within the inundation extent but not near a floodway, it has been assigned management zone B, regardless of whether it is flood-dependent or flood-impacted.

Where an Aboriginal cultural asset is located outside of the floodway network, it is assumed to not be flood-dependent or flood-impacted. These areas are assigned management zone C if it is located within the flood fringe (see section 5.3.6.1) or management zone CU if it is located within an urban area (see 5.3.6.2).

5.3.2.3 Aboriginal cultural assets requiring special protection (management zone SP)

For some flood-dependent Aboriginal cultural assets, there is a need to apply a special protection management zone. These areas are identified through:

- a high level of flood-dependency, such as waterholes, swamps, billabongs or fish traps that are strongly dependent on the passage of floodwater, and
- a high level of cultural significance to the Aboriginal community, including spiritual, archaeological or resource use-values.

These areas are also recorded on the AHIMS.

Management zone SP has the greatest restriction on the types of flood works permitted. An example of this would be a ceremonial site located within a wetland that is listed on AHIMS.

5.3.3 Identified heritage sites

Heritage sites may be sensitive to changes in flood behaviour or disturbance from flood work construction. The heritage sites identified within the floodplain that are listed on the NSW State Heritage Register are not dependent on or connected with flooding. However, some of these sites may be flood-impacted as they could be damaged by flooding or directly impacted during the construction of a flood work.

Any heritage sites located:

- within a floodway have been assigned management zone A
- within the inundation extent have been assigned management zone B
- outside the floodway network have been assigned management zone C or CU.

Where a flood-impacted heritage site is located within a floodway, there are rules proposed that allow for heritage site protection works to be constructed to protect these areas from the impacts of flooding. Please refer to the rules and assessment criteria for management zone A in section 3.7.2.1 for more information.

As part of assessing and determining an application for a flood work approval, a search of the State Heritage Inventory must be conducted. This online search tool holds information about most statutory protected heritage items in NSW, including the State Heritage Register.

5.3.4 Identified ecological assets

The following types of ecological assets, shown in the Ecological Asset Map, have been identified within the floodplain:

- semi-permanent wetlands (non-woody): requires flooding every 1–2 years
- floodplain wetlands (flood-dependent shrubland wetlands): requires flooding every 1–7 years
- flood-dependent forest/woodland (wetlands): requires flooding every 1–4 years

- flood-dependent woodland: requires flooding every 3–10 years.

The ecological assets are identified using the best available vegetation mapping and survey information, including the NSW State Vegetation Type Map¹⁵ and wetland mapping.

The ecological assets are categorised according to the flooding requirements of their vegetation communities, which correlates to the degree of connectivity required to a floodway. Semi-permanent wetlands have the highest dependency on flooding, while flood-dependent woodland have the lowest dependency on flooding.

In addition, there are flood-dependent ecological assets which contain a special feature, such as an identified waterbird breeding site or nationally recognised wetland, which warrants an additional layer of protection.

When assigning management zones, the following approach is taken:

- semi-permanent wetlands will be assigned management zone A
- any flood-dependent ecological assets with a special feature will be assigned management zone SP
- identified flood-dependent ecological assets within the floodway network will be assigned:
 - management zone A if within a floodway
 - management zone B with a connector if near a floodway, or
 - management zone B without a connector if not near a floodway
- identified ecological assets (other floodplain ecosystems) outside the floodway network will be assigned management zone C or CU.

More information on connectors is provided in section 5.3.5 Connectors (management zone A).

In response to feedback received in Stage 1 public consultation, multiple refinements were made to the identified flood-dependent ecological assets to reflect private gardens or areas where crops are grown. These refinements can be seen in Appendix 3 of the [What we heard report for Stage 1 public consultation](#).

5.3.4.1 Ecological assets within or near a floodway (management zone A or B)

All semi-permanent wetlands located within or near a floodway will be assigned management zone A. For those located near a floodway, a connector will be used to ensure the flow of floodwater from the floodway to the asset is maintained.

All other flood-dependent ecological assets will be assigned management zone A only if they are located within a floodway. If they are located near a floodway, they will be assigned management zone B and have a connector which runs to and through the asset to ensure the flow of floodwater from the floodway to the asset is maintained.

¹⁵ Department of Planning and Environment (2022) NSW State Vegetation Type Map. Current Release C1.1.M1.1 (December 2022)

5.3.4.2 Ecological assets not near a floodway (management zone B, C or CU)

Flood-dependent ecological assets located within the inundation extent but not near a floodway will be assigned management zone B without the use of a connector.

Where an ecological asset is located outside of the floodway network, it is assumed to not be entirely flood dependent. These areas, referred to as other floodplain ecosystems, are assigned management zone C if it is located within the flood fringe (see section 5.3.6.1) or management zone CU if it is located within an urban area (see section 5.3.6.2).

5.3.4.3 Ecological assets requiring special protection (management zone SP)

For some flood-dependent ecological assets, there is a need to apply a special protection management zone. These areas of the floodplain are identified as locations:

- with a demonstrated history of supporting waterbird, native fish or frog populations, such as a lagoon, including:
 - habitat for waterbird species, including those listed under the *Biodiversity Conservation Act 2016* (NSW) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
 - waterbird breeding sites
 - habitat for native fish and freshwater turtles
 - habitat for native frogs, including survey sites that find threatened species (for example, the Southern Bell Frog *Litoria raniformis*), or
- that have the capacity to provide refuge for aquatic life during drought, such as a billabong or lagoon, or
- that are recognised in local, state or Commonwealth legislation or policy, including
 - areas of international conservation significance (RAMSAR wetlands)
 - areas of national conservation significance (Directory of Important Wetlands in Australia), or
- that have received or are a priority for NSW and Commonwealth Government environmental water deliveries, or
- a combination of any of the above.

Where the asset is located within the inundation extent, a connector will be used to ensure the flow of floodwater from the floodway to the asset is maintained.

Management zone SP has the greatest restriction on the types of flood works permitted.

There are 928 km² of identified areas in the floodplain which are being assigned management zone SP. These include:

- habitat for migratory waterbird species
- habitat for native fish and freshwater turtles
- waterbird breeding sites
- aquatic drought refuge (lagoons or billabongs)

- nationally significant wetland (Directory of Important Wetlands in Australia)
- areas that have received Commonwealth environmental water
- sites throughout the NSW Murray Valley National Park, Koondrook-Perricoota State Forest and other privately owned lands.

5.3.5 Connectors (management zone A)

Connectors are pathways that connect flood-dependent ecological assets and flood-dependent Aboriginal cultural assets to the floodway. They are assigned management zone A to ensure the flow of floodwater from the floodway to the asset is maintained.

The location and size of connectors are determined using satellite imagery, LiDAR and modelling results to confirm existing flood flow paths.

All connectors are assigned management zone A.

5.3.6 Flood fringe (management zone C and CU)

Areas of the floodplain that are not within the floodway network can be categorised as flood fringe areas or flood protected areas.

5.3.6.1 Flood fringe (management zone C)

The flood fringe is an area which may be flooded but is not considered critical in the flow of water during times of flood. Flood-protected areas do not receive floodwater. This may be due to the area being higher ground or the presence of existing flood works preventing the passage of floodwater.

Areas of flood fringe are assigned management zone C.

5.3.6.2 Urban area (management zone CU)

Flood risk in urban areas is generally managed by local councils through flood risk management plans and studies developed in accordance with the Flood Risk Management Manual. Urban areas may also be protected from flooding by a town levee.

Urban areas where a flood risk management plan or strategy applies, or are protected by a town levee, are assigned management zone CU.

5.4 Appendix 4 Comparison with historical planning arrangements

5.4.1 Overview

The FMP consolidates and updates the historical floodplain management planning arrangements to:

- meet the requirements of the WM Act
- establish consistent rules for flood works across the floodplain
- improve the coordinated regulation of flood works across the southern Murray–Darling Basin.

This is a change from the previous floodplain management planning arrangements in the historical localised FMPs. Under the previous planning arrangements any type of flood work within floodways may be applied for, subject to comprehensive assessment processes and advertising requirements for most types of flood works.

The difference in approaches between the historical localised FMPs and the new FMP relates to the requirement under the WM Act for an FMP to consider the risk to life and property from the effects of flooding. The construction of a flood work in a floodway can significantly increase the risk to life and property; both on the landholding where the flood work is constructed and on neighbouring properties.

5.4.2 Previous planning arrangements

The previous floodplain management arrangements consist of the following localised FMPs (now repealed) with associated declared floodplains (now repealed) adopted under the *Water Act 1912*:

- Tuppall and Bullatale Creeks Floodplain Management Plan (2006)
- Stage 1: Edward and Wakool Rivers (Deniliquin to Moama-Moulamein Railway) Floodplain Management Plan (2011)
- Stage 2: Wakool River (Moama-Moulamein Railway to Gee Gee Bridge) Floodplain Management Plan (2011)
- Stage 3: Edward and Niemur Rivers (Moama-Moulamein Railway to Liewah and Mallan) Floodplain Management Plan (2011)
- Lower Edward-Wakool (Stage 4) (Noorong Road to Wakool Murray Junction) Floodplain Management Plan (2005).

Table 14, Table 15 and Table 16 compare the key components of the repealed localised FMPs with the NSW Murray Valley FMP.

5.4.3 Comparison between the historical localised FMP and the NSW Murray Valley FMP

Table 14, Table 15 and Table 16 detail and compare the key components of the repealed localised FMPs with those of the NSW Murray Valley FMP. They also compare the designated floodways in each repealed plan with those in the NSW Murray Valley FMP.

Table 14: Summary and comparison of Tuppal and Bullatale localised FMP and NSW Murray Valley FMP

Component	New FMP	Tuppal and Bullatale FMP (2006)	Comparison
Design flood	2022 (large design flood) 2016 (small design flood)	1975	It is appropriate that the new FMP relies on more recent flooding events as they are more commonly remembered by the local community.
Floodway network	Floodways and inundation extent Management zones A, B and SP	FMP has one floodway network for the 1975 design flood, based on: - existing FMP model review of 1978 floodway-levee scheme for floodplain development - floodplain management principles covering hydraulic, environmental, socio-economic and legislative criteria and Floodplain Management Committee (FMC) feedback.	The proposed floodways in the new FMP are generally narrower than those identified in the repealed localised FMP, and the surrounding areas are mapped as the inundation extent. The difference between the approaches to floodways taken in the repealed localised FMP and the new FMP is shown in conceptual floodway cross-sections in Figure 7 and Figure 8 in the Report to assist Stage 1 public consultation , published on the department's website.
Outside floodway network	Flood fringe and flood-protected Management zones C and CU	Not applicable.	Management zones C and CU have been included in the new FMP to ensure that flood work applications are assessed and determined consistently across the floodplain. The repealed localised FMP did not include these zones.

Component	New FMP	Tuppal and Bullatale FMP (2006)	Comparison
Monitoring and reporting	Performance indicators specified that allow for measurement of the success of the strategies in achieving the objectives of the new FMP.	Key locations for flood monitoring were provided in the repealed localised FMP, with monitoring programs led by the then Department of Natural Resources. Environmental monitoring of flood-dependent ecosystems coordinated by the then Department of Natural Resources. Guidelines for monitoring activities were set out in the repealed localised FMP.	An <u>audit of the repealed localised FMP</u> in 2020 identified that many of the implementation recommendations were not implemented. The new FMP allows for flexibility in how the performance indicators are applied while ensuring that they are clearly linked to the associated strategies and objectives.
Existing flood works	If existing works within management zone A or SP cannot comply with the specifications, they may be approved, subject to complying with the standard assessment criteria: • access roads • supply channel (below ground) • stock refuge • infrastructure protection works. In addition, existing above ground supply channels may be approved, subject to complying with the standard assessment criteria. Existing works in management zone B that were constructed prior to 7 July 2000 may be excluded from the requirement to advertise and comply with the hydraulic assessment criteria if they are determined to not cause significant impacts nearby. To access this rule, applications must be	Existing flood works that are causing connectivity and hydraulic issues were identified in the repealed localised FMP and proposed modifications or remedial measures are specified to allow approval of works and resolve identified issues. All existing works, not identified in the proposed modifications, were treated the same as proposed works.	The repealed localised FMP provided modification requirements to allow for the approval of existing flood works which are causing connectivity and hydraulic issues. Conversely, the new FMP does not identify unapproved flood works. Instead, it provides for the approval of some existing flood works in management zone A, B and SP while ensuring all flood works (existing or proposed) are treated consistently in management zones C and CU.

Component	New FMP	Tuppall and Bullatale FMP (2006)	Comparison
	lodged within the first 3 years of the FMP commencing. Existing works in management zone C and CU are treated in the same manner as proposed works. An overview of existing approved flood works is provided in the new FMP, as required under the WM Act.		
Advertisement	Required for flood works in management zone B that are: • greater than 40 cm above the natural surface of the ground, or • a stock refuge with a maximum area larger than 10 hectares and no other stock refuge in that area, or • a stock refuge on a property and the total maximum area of all stock refuges is larger than 5% of total property area, or • an infrastructure protection work with an area that is larger than 1% of the total area of the property.	Required for flood works that could alter flood flow paths or affect flood-dependent ecosystems or sensitive areas. All works in floodways required advertising – apart from existing listed flood works modified in accordance with FMP actions for remediation. All works outside floodways did not require advertising.	The requirement for advertisement is less extensive under the new FMP compared to the repealed localised FMP.

Component	New FMP	Tuppall and Bullatale FMP (2006)	Comparison
Rules for management zone A	Limited types of works permitted: • access roads • stock refuges • supply channel (below ground) • infrastructure protection works • enhancement flood works • flood protection works. Standard assessment criteria applied to all flood works except enhancement flood works which also require hydraulic assessment criteria.	Floodway network is the most equivalent area in the repealed localised FMP. All works within the floodway network were assessed as non-complying. No restriction on the types of works permitted in floodways. Hydraulic and environmental assessment criteria, including assessment for local and cumulative impacts, were applied to all flood works.	The new FMP restricts the types of works permitted but only applies standard assessment criteria. Conversely, the repealed localised FMP permitted any type of flood work but applied hydraulic assessment criteria. Hence, many types of flood works would not be permitted as they could not meet the criteria specified.
Rules for management zone B	Any type of flood work permitted subject to standard and hydraulic assessment criteria. Existing works in management zone B that were constructed prior to 7 July 2000 may be excluded from the requirement to advertise and comply with the hydraulic assessment criteria if they are determined to not cause significant impacts nearby. To access this rule, applications must be lodged within the first 3 years of the FMP commencing.	No equivalent area in the repealed localised FMP – management zone B will include some areas that were previously within floodways (non-complying – see management zone A above) and areas outside of floodways that are subject to inundation (see management zone C below).	The approach taken in the new FMP and repealed localised FMP is similar. Under the new FMP, larger works are required to be advertised and assessed under the hydraulic criteria while smaller works are to be assessed under the standard criteria.

Component	New FMP	Tuppal and Bullatale FMP (2006)	Comparison
Rules for management zone C and CU	Any type of flood work permitted subject to complying with standard assessment criteria. Hydraulic assessment criteria applied when flood work may impact on high value infrastructure.	Any type of flood work was permitted subject to complying with basic assessment criteria.	The repealed localised FMP did not identify the flood fringe or urban areas. The approach taken in the new FMP and repealed localised FMP is similar. However, the new FMP specifies situations where more assessment may be required, such as the potential to impact high value infrastructure.
Rules for management zone SP	Limited types of works permitted: • access roads • stock refuge • infrastructure protection works • enhancement flood works • flood protection works. Standard assessment criteria applied to all flood works and hydraulic assessment criteria also applied to enhancement flood works.	Not applicable.	The new FMP identifies areas of the floodplain that are especially vulnerable to the potential impacts associated with a flood work and recognises this through restricting the types of flood works permitted. However, due to the large spatial areas of management zone SP in the Murray, the FMP includes provisions for some works not typically permitted in other FMPs.
Risk to life and property	This is considered through the development of the floodway network and limit on the types of flood works permitted within a floodway.	Not applicable.	The WM Act requires the new FMP to consider the risk to life and property from the effects of flooding. Conversely the <i>Water Act 1912</i> did not have the same requirement for the repealed localised FMP.

Table 15: Summary and comparison of Lower Edward-Wakool (Stage 4) localised FMP and draft NSW Murray Valley FMP

Component	New FMP	Lower Edward-Wakool FMP (2005)	Comparison
Design flood	2022 (large design flood) 2016 (small design flood)	1956 (1993 also used to fill gaps where partial data exists)	It is appropriate that the new FMP relies on more recent flooding events as they are more commonly remembered by the local community.
Floodway network	Floodways and inundation extent Management zones A, B and SP	FMP had one floodway network for the 1956 design flood, augmented with flow distributions and flood levels from the 1993 flood where the 1956 flood data was lacking. Some floodway areas were limited to 1993 flood levels. FMP floodway network design based on: - sizing floodway capacities for design flood using Manning's equation - floodplain management principles covering hydraulic, environmental, socio-economic and legislative criteria.	The proposed floodways in the new FMP are generally narrower than that identified in the repealed localised FMP, and the surrounding areas are mapped as the inundation extent. The difference between the approaches to floodways taken in the repealed localised FMP and the new FMP is shown in conceptual floodway cross-sections in Figure 7 and Figure 8 in the <u>Report to assist Stage 1 public consultation</u> , published on the department's website.
Outside floodway network	Flood fringe and flood-protected Management zones C and CU	FMP identified 'areas of possible wetland value' which sat outside the FMP floodway network and were blocked from flooding due to existing floodplain development. Options for wetland rehabilitation were considered when these works were assessed.	Management zones C and CU have been included in the new FMP to ensure that flood work applications are assessed and determined consistently across the floodplain. The existing localised FMP does not include these zones.

Component	New FMP	Lower Edward-Wakool FMP (2005)	Comparison
Monitoring and reporting	Performance indicators are specified to measure how effectively the strategies achieve the objectives of the new FMP.	No monitoring and reporting information in the FMP.	An <u>audit of the repealed localised FMP</u> in 2020 identified that many of the implementation recommendations were not implemented. The new FMP allows for flexibility in how the performance indicators are applied while ensuring that they are clearly linked to the associated strategies and objectives.
Existing flood works	If existing works within management zone A or SP cannot comply with the specifications, they may be approved, subject to complying with the standard assessment criteria: • access roads • supply channel (below ground) • stock refuge • infrastructure protection works. In addition, existing above ground supply channels may be approved, subject to complying with the standard assessment criteria. Existing works in management zone B that were constructed prior to 7 July 2000 may be excluded from the requirement to advertise and comply with the hydraulic assessment criteria if they are determined to not cause significant impacts nearby. To access this rule, applications must be	Existing flood works that are causing connectivity and hydraulic issues were identified in the repealed localised FMP and proposed modifications or remedial measures are specified to allow approval of works and resolve identified issues. All existing works, not identified in the proposed modifications, were treated the same as proposed works.	The repealed localised FMP provided modification requirements to allow for the approval of existing flood works which were causing connectivity and hydraulic issues. Conversely, the new FMP does not identify unapproved flood works. Instead, it provides for the approval of some existing flood works in management zone A, B and SP while ensuring all flood works (existing or proposed) are treated consistently in management zones C and CU.

Component	New FMP	Lower Edward-Wakool FMP (2005)	Comparison
	lodged within the first 3 years of the FMP commencing. Existing works in management zone C and CU are treated in the same manner as proposed works. An overview of existing approved flood works is provided in the new FMP, as required under the WM Act.		
Advertisement	Required for flood works in management zone B that are: - greater than 40 cm above the natural surface of the ground, or - a stock refuge with a maximum area larger than 10 hectares and no other stock refuge in that area, or - a stock refuge on a property and the total maximum area of all stock refuges is larger than 5% of total property area, or - an infrastructure protection work with an area that is larger than 1% of the total area of the property.	Required for works in hydraulically sensitive areas or affecting wetlands. All works in floodways required advertising – apart from those where the landholder can provide evidence that they comply with the FMP. Floodways were to be kept open to convey the 1956 flood discharge at flood levels that do not exceed known historical levels. All works outside floodways did not require advertising.	The requirement for advertisement is less extensive under the new FMP compared to the repealed localised FMP.

Component	New FMP	Lower Edward-Wakool FMP (2005)	Comparison
Rules for management zone A	Limited types of works permitted: • access roads • stock refuges • supply channel (below ground) • infrastructure protection works • enhancement flood works • flood protection works. Standard assessment criteria applied to all except enhancement flood works which also requires hydraulic assessment criteria.	No restriction on the types of works permitted in floodways. Hydraulic and environmental assessment criteria applied to all flood works. Cumulative impacts need to be addressed.	The new FMP restricts the types of works permitted but only applies standard assessment criteria. Conversely, the repealed localised FMP permitted any type of flood work but applied hydraulic assessment criteria. Hence, many types of flood works would not be permitted as they could not meet the criteria specified.
Rules for management zone B	Any type of flood work permitted subject to standard and hydraulic assessment criteria. Existing works in management zone B that were constructed prior to 7 July 2000 may be excluded from the requirement to advertise and comply with the hydraulic assessment criteria if they are determined to not cause significant impacts nearby. To access this rule, applications must be lodged within the first 3 years of the FMP commencing.	No equivalent area in the repealed localised FMP. Management zone B includes some areas that were previously within floodways (non-complying – see management zone A above) and areas outside of floodways that are subject to inundation (see management zone C below).	The approach taken in the new FMP and repealed localised FMP is similar. Under the new FMP, larger works are required to be advertised and be assessed under the hydraulic criteria while smaller works are to be assessed under the standard criteria.

Component	New FMP	Lower Edward-Wakool FMP (2005)	Comparison
Rules for management zone C and CU	Any type of flood work permitted subject to complying with standard assessment criteria. Hydraulic assessment criteria applied when flood work may impact high value infrastructure.	Any type of flood work was permitted subject to complying with basic assessment criteria.	The repealed localised FMP did not identify the flood fringe or urban areas. The approach taken in the new FMP and repealed localised FMP is similar. However, the new FMP specifies situations where more assessment may be required, such as the potential to impact high value infrastructure.
Rules for management zone SP	Limited types of works permitted: • access roads • stock refuge • infrastructure protection works • enhancement flood works • flood protection works. Standard assessment criteria applied to all flood works and hydraulic assessment criteria also applied to enhancement flood works.	Not applicable.	The new FMP identifies areas of the floodplain that are especially vulnerable to the potential impacts associated with a flood work and recognises this through restricting the types of flood works permitted. However, due to the large spatial areas of management zone SP in the Murray, the new FMP includes provisions for some works not typically permitted in other FMPs.
Risk to life and property	This is considered through the development of the floodway network and limit on the types of flood works permitted within a floodway.	Not applicable.	The WM Act requires the new FMP to consider the risk to life and property from the effects of flooding. Conversely the <i>Water Act 1912</i> did not have the same requirement for the repealed localised FMP.

Table 16: Summary and comparison of Stage 1 Edward Wakool, Stage 2 Wakool and Stage 3 Edward and Niemur localised FMPs and draft NSW Murray Valley FMP

Component	New FMP	Stage 1, 2 and 3 FMPs (2011)	Comparison
Design flood	2022 (large design flood) 2016 (small design flood)	1975	It is appropriate that the new FMP relies on more recent flooding events as they are more commonly remembered by the local community.
Floodway network	Floodways and inundation extent Management zones A, B and SP	FMP had one floodway network for the 1975 design flood, based on: - repealed localised FMP model review of 1978 floodway-levee scheme for floodplain development - floodplain management principles covering hydraulic, environmental, socio-economic & legislative criteria & Floodplain Management Committee (FMC) feedback.	Management zones were not a component of repealed localised FMPs in the Murray Valley. The floodways in the new FMP are generally narrower than those identified in the repealed localised FMP, and the surrounding areas are mapped as the inundation extent. The difference between the approaches to floodways taken in the repealed localised FMP and the new FMP is shown in conceptual floodway cross-sections in Figure 7 and Figure 8 in the Report to assist Stage 1 public consultation , published on the department's website.
Outside floodway network	Flood fringe and flood-protected Management zones C and CU	Not applicable.	Management zones C and CU have been included in the new FMP to ensure that flood work applications are assessed and determined consistently across the floodplain. The repealed localised FMP did not include these zones.

Component	New FMP	Stage 1, 2 and 3 FMPs (2011)	Comparison
Monitoring and reporting	Performance indicators are specified to measure how effectively the strategies achieve the objectives of the new FMP.	Key locations for flood monitoring were provided in the repealed localised FMP, with monitoring programs led by the then Department of Natural Resources. Environmental monitoring of flood-dependent ecosystems coordinated by the then Department of Natural Resources. Guidelines for monitoring activities were set out in repealed localised FMP.	An <u>audit of the repealed localised FMP</u> in 2020 identified that many of the implementation recommendations were not implemented. The new FMP allows for flexibility in how the performance indicators are applied while ensuring that they are clearly linked to the associated strategies and objectives.
Existing flood works	If existing works within management zone A or SP cannot comply with the specifications, they may be approved, subject to complying with the standard assessment criteria: • access roads • supply channel (below ground) • stock refuge • infrastructure protection works. In addition, existing above ground supply channels may be approved, subject to complying with the standard assessment criteria. Existing works in management zone B that were constructed prior to 7 July 2000 may be excluded from the requirement to advertise and comply with the hydraulic assessment criteria if they are determined to not cause significant impacts nearby. To access this rule, applications must be	Existing flood works that are causing connectivity and hydraulic issues are identified in the repealed localised FMP and proposed modifications or remedial measures are specified to allow approval of works and resolve identified issues. All existing works, not identified in the proposed modifications, were treated the same as proposed works.	The repealed localised FMP provides modification requirements to allow for the approval of existing flood works which are causing connectivity and hydraulic issues. Conversely, the new FMP does not identify unapproved flood works. Instead, it provides for the approval of some existing flood works in management zone A, B and SP while ensuring all flood works (existing or proposed) are treated consistently in management zones C and CU.

Component	New FMP	Stage 1, 2 and 3 FMPs (2011)	Comparison
	lodged within the first 3 years of the FMP commencing. Existing works in management zone C and CU are treated in the same manner as proposed works. An overview of existing approved flood works is provided in the new FMP, as required under the WM Act.		
Advertisement	Required for flood works in management zone B that are: • greater than 40 cm above the natural surface of the ground, or • a stock refuge with a maximum area larger than 10 hectares and no other stock refuge in that area, or • a stock refuge on a property and the total maximum area of all stock refuges is larger than 5% of total property area, or • an infrastructure protection work with an area that is larger than 1% of the total area of the property.	Required for flood works that could alter flood flow paths or affect flood-dependent ecosystems or sensitive areas. All works in floodways required advertising – apart from existing listed flood works modified in accordance with FMP actions for remediation. All works outside floodways did not require advertising.	The requirement for advertisement is less extensive under the new FMP compared to the repealed localised FMP.

Component	New FMP	Stage 1, 2 and 3 FMPs (2011)	Comparison
Rules for management zone A	Limited types of works permitted: • access roads • stock refuges • supply channel (below ground) • infrastructure protection works • enhancement flood works • flood protection works. Standard assessment criteria applied to all except enhancement flood works which also requires hydraulic assessment criteria.	Floodway network is most equivalent area in repealed localised FMP. All works within the floodway network assessed as non-complying. No restriction on the types of works permitted in floodways. Hydraulic and environmental assessment criteria, including assessment for local and cumulative impacts applied to all flood works. Approval not required for infrastructure protection works solely for the protection of high value infrastructure (houses, workshops and sheds), unless part of an integrated development for larger areas that incorporated levee banks.	The new FMP restricts the types of works permitted but only applies standard assessment criteria. Conversely, the repealed localised FMP permitted any type of flood work but applied hydraulic assessment criteria. Hence, many types of flood works would not be permitted as they could not meet the criteria specified.
Rules for management zone B	Any type of flood work permitted subject to standard and hydraulic assessment criteria. Existing works in management zone B that were constructed prior to 7 July 2000 may be excluded from the requirement to advertise and comply with the hydraulic assessment criteria if they are determined to not cause significant impacts nearby. To access this rule, applications must be lodged within the first 3 years of the FMP commencing.	No equivalent area in repealed localised FMP – management zone B will include some areas that were previously within floodways (non-complying – see management zone A above) and areas outside of floodways that are subject to inundation (see management zone C below).	The approach taken in the new FMP and repealed localised FMP is similar. Under the new FMP, larger works are required to be advertised and assessed under the hydraulic criteria while smaller works are to be assessed under the standard criteria.

Component	New FMP	Stage 1, 2 and 3 FMPs (2011)	Comparison
Rules for management zone C and CU	Any type of flood work permitted subject to complying with standard assessment criteria. Hydraulic assessment criteria applied when flood work may impact high value infrastructure.	Any type of flood work was permitted subject to complying with basic assessment criteria.	The repealed localised FMP did not identify the flood fringe or urban areas. The approach taken in the new FMP and repealed localised FMP is similar. However, the new FMP specifies situations where more assessment may be required, such as the potential to impact high value infrastructure.
Rules for management zone SP	Limited types of works permitted: • access roads • stock refuge • infrastructure protection works • enhancement flood works • flood protection works. Standard assessment criteria applied to all flood works and hydraulic assessment criteria also applied to enhancement flood works.	Not applicable.	The new FMP identifies areas of the floodplain that are especially vulnerable to the potential impacts associated with a flood work and recognises this through the restriction on the types of flood works permitted. However, due to the large spatial areas of management zone SP in the Murray, the new FMP includes provisions for some works not typically permitted in other FMPs.
Risk to life and property	This is considered through the development of the floodway network and limit on the types of flood works permitted within a floodway.	Not applicable.	The WM Act requires the new FMP to consider the risk to life and property from the effects of flooding. Conversely the <i>Water Act 1912</i> did not have the same requirement for the repealed localised FMP.

5.5 Appendix 5 Socio-economic impact assessment

5.5.1 Background

A socio-economic impact assessment is a useful tool to help understand the potential range of impacts of a proposed change, and the likely response if the change occurs. This understanding can help design impact mitigation strategies to minimise negative and maximise positive impacts of any change. This is a qualitative assessment only.

5.5.2 Scope of the assessment

5.5.2.1 Nature of the proposed change

Agricultural production is a significant contributor to the economy of the NSW Murray Valley Floodplain. To enhance agricultural productivity, works have been built on the floodplain to improve land used for irrigated cropping, irrigated perennial horticulture, dryland cropping and grazing. Typically, flood works such as levees, earthworks, banks and channels are built to protect crops, land, stock and properties from flooding, provide on farm access, and to manage and store irrigation, stock and domestic water. It is the construction and use of these flood works, both existing and proposed, that is affected by the FMP.

The FMP applies to the assessment and determination of flood work approvals within the floodplain, including applications to amend existing flood work approvals. It does not apply to existing flood works located outside the floodplain. Urban areas in the floodplain will be minimally affected as flood risk management in these urban areas is the responsibility of local council.

The following assumptions are also considered:

- A flood work approval is required under section 91D of the WM Act regardless of whether there is an FMP in place. Some activities considered low-risk or covered by other legislation are exempt from the rules in FMPs.
- Even if there is no FMP in place, the determining authority for flood work approvals (WaterNSW or the department) will need to consider the water management principles set out in section 5 of the WM Act, as well as address the minimal harm requirements under section 97 (2) of the Act.
- New FMPs are developed using the best available information and build on existing floodplain management planning arrangements.
- FMPs may be amended during their 10-year term if it is in the public interest.
- FMPs will be upgraded as better data and modelling becomes available.

5.5.2.2 Stakeholders who are potentially impacted

There are stakeholder groups who are potentially impacted by the FMP with overlap between groups. These groups in order of least potential impact to greatest potential impact are those landholders:

- within the new floodplain
- outside of the area of the historical localised FMP

- within the inundation extent (management zone B) on their property
- who have a floodway (management zone A) on their property
- who have an area of ecological or cultural significance (management zone SP) on their property.

Floodplain land used for irrigated cropping, irrigated perennial horticulture, dryland cropping and grazing are the primary commercial activities that may be affected by the FMP. Based on engagement activities undertaken for public consultation, private landholders in the floodplain range from small family-owned farms to large corporate agribusinesses with major irrigation infrastructure. However, the FMP may be a useful tool for property and business planning as it relates to potential flooding impacts.

The major land uses in the NSW Murray Valley Floodplain¹⁶ include:

- grazing (native vegetation and modified pastures)
- cropping (including irrigated cropping)
- irrigated perennial horticulture
- forestry
- intensive animal production.

Accordingly, agriculture, forestry and fishing (as a group) are the primary employment industries for the 4 local government areas that cover the NSW Murray Valley Floodplain¹⁷.

5.5.2.3 Key impacts of interest

The following key impacts of the FMP have been identified:

- a. the economic cost of gaining approval for existing and future flood works (direct impact), including:
 - iv. application fees
 - v. advertising fees, where required
 - vi. preparation of technical information including hydraulic modelling and ecological studies
- b. the ability or potential inability to gain approval for existing flood works, depending on where the work is located and the management zone classification (direct impact)
- c. the ability or inability to gain approval for future flood works, depending on the management zone classification on an individual property (direct impact)
- d. changes to the risk to life and property from the effects of flooding, where the FMP aims to steer inappropriate development away from high-risk floodways and to minimise changes to flood behaviour in other areas that may cause impacts on neighbouring landholdings (positive impact)
- e. the economic cost to maintain a flood work approval (extension fees)

¹⁶ NSW Landuse 2017 version 1.5 published December 2023

¹⁷ Sourced from REMPLAN Economy based on statistics from the Australian Bureau of Statistics

- f. the economic cost of constructing flood works (for example, the cost of earth moving equipment and technical expertise)
- g. the economic cost of maintaining flood works, particularly prior to and after flood events.

5.5.2.4 Available information and usefulness

The following information has been identified to support the assessment.

Table 17: Summary of available information to support the assessment

Available information	Value (if known)	Usefulness
Area of the floodplain	8,061km ²	Identifying the scale of impacts.
% of the floodplain is covered by a historical localised FMP	91%	Identifying areas where there is more change as opposed to the area that was already subject to an in-force FMP.
% of floodplain covered by floodways (Management zones A and SP)	8.4%	Identifying areas where the risk to life and property is the greatest and where flood works will be most restricted by the FMP.
% of floodplain subject to flooding but outside of a floodway (Management zone B)	11.5%	Identifying areas where landholders may need flood works to protect cropped areas or infrastructure and where the proposed hydraulic assessment criteria will apply.
Cost of gaining a flood work approval (external influence)	As of June 2026, \$5,100 (inclusive of advertising, if required) or \$652.75 ¹⁸ for an administrative amendment without engineering review.	Understanding how expensive and difficult it may be for an individual landholder to plan for and seek a flood work approval for a particular type of work. Large corporations may be able to absorb costs as part of business as compared to small family farms.
Cost of constructing a flood work (external influence)	Unknown and variable depending on the scale of the work.	Understanding how expensive and difficult it may be for an individual landholder to construct a flood work in accordance with their approval (drawn from the specifications in the FMP).

¹⁸ WaterNSW 2025-26 Application Fees. The cost of a flood work application is not set by IPART.

Available information	Value (if known)	Usefulness
Cost of maintaining a flood work (external influence)	Unknown and variable depending on the scale of the work.	Understanding how expensive and difficult it may be for an individual landholder to maintain flood works in accordance with their approval. For example, an embankment may be required to be maintained at a specified height.

5.5.2.5 Types of activities which may be affected: who, when and where

The type of activity affected by the FMP is limited to the construction and use of flood works within the declared floodplain. This activity could be undertaken by any landholder at any time. Anecdotal feedback from community members during the department's June 2023 information gathering (listening tour) suggests that this activity may increase prior to and during major flood events as landholders respond to the threat of flooding on their properties and communities.

5.5.2.6 Extent or scale of the activities potentially affected

The construction and use of flood works throughout the floodplain will be affected to some extent. However, the largest impact will be on landholders with properties within the floodways (management zone A) and special protection areas (management zone SP) where the types of flood works are proposed to be restricted. However, feedback from public consultation suggests that landholders are generally aware of floodways on their properties and the limitations they pose for agricultural production and property management.

5.5.2.7 Other factors impacting these activities

Other factors that will impact the construction and use of flood works in the floodplain may include:

- The requirement under section 91D the WM Act to have a flood work approval and community awareness (or lack of awareness) of this requirement and related exemptions in the regulation.
- Community awareness of historical planning arrangements for flood work development and the evolution of floodplain management reform. For example, knowledge of the historical guidelines for floodplain development released in 1984 and the historical localised FMPs that were adopted between 2000 and 2011.
- How recent communities have experienced major flooding. Many landholders and communities are still recovering from the 2022 floods. This may include plans to build or rebuild flood works to protect homes and infrastructure or to improve on-farm access.

5.5.2.8 Geographic location

Potential impacts of the FMP are limited to the area within the floodplain boundary. Some landholders may have only part of their property located inside the floodplain. The FMP builds on previous floodplain management planning arrangements. Landholders within the historical localised FMPs areas will be less impacted than those landholders in areas without an FMP.

There may be individual farm level impacts that are more significant depending on where the property is situated in the landscape. The FMP will likely have a greater impact on landholders whose properties are within the mapped floodways and areas of special protection (management zones A and SP). Landholders whose properties are within management zones B (flood storage and inundation extent) and C (flood fringe) will also be impacted, where a flood work approval is also required, subject to meeting the relevant advertising requirements and assessment criteria.

Urban areas in the floodplain (mapped as management zone CU) will be minimally affected as flood risk management in these areas are the responsibility of local government.

5.5.2.9 Proportion of the group or proportion of activities likely to be affected

The NSW Murray Valley floodplain is 8,061 km² in area and approximately 19.9% of this area is mapped as management zone A (floodways) and management zone SP (special protection). The ability to construct and use flood works is most restricted in these zones.

However, the level of impact also depends on how the affected land can be used. Floodways generally align with rivers and creeks and will therefore be unsuitable for cropping or horticulture. Similarly, it is unlikely that a flood work will currently be approved in a floodway with a comprehensive hydraulic assessment being required for all flood work applications in areas outside of an FMP.

Most of the floodplain is allocated to management zones B (23.1%) and C (56.5%), where the type of flood works is not restricted, although a flood work approval will still be required, subject to meeting the relevant advertising requirements and assessment criteria.

5.5.3 Assessment of potential impact

An assessment of the potential impact of the FMP against the key impacts identified under section 5.5.2.3 needs to be undertaken with consideration of external influence, as detailed in section 5.5.2.7. The impact of the FMP can be described as high, moderate or low but may be reduced when considered against the pre-existing impact of the external influence. For example, the FMP may have an identified high impact on a specified activity but there is also a high external influence on this impact. In this example, the FMP's impact (marked in red) is low once the external influence is considered. This is demonstrated in Table 18 below.

Table 18: Impact assessment matrix

		External influence		
		Low	Moderate	High
Impact of the FMP (intensity of the impact)	Low	Low	Low	Low
	Moderate	Moderate	Low	Low
	High	High	Moderate	Low

The assessment of the key impacts of the FMP and adjustment in response to external influences is detailed in Table 19. This assessment was updated following Stage 2 public exhibition of the FMP to reflect feedback regarding approvals for existing flood works in management zone B.

Measures to mitigate potential negative impacts of the FMP are provided in section 5.5.3.2.

Table 19: Assessment of key potential negative impacts of the FMP

Factor	Types of new flood works are restricted in Management zone A and SP	Types of existing flood works are restricted in Management zones A and SP	Applicable assessment criteria in management zones B and C	Cost to obtain a flood work approval	Construction and maintenance
Impact	Lost ability to seek approval for new flood works other than access roads, infrastructure protection works, stock refuges, supply channels, enhancement flood works, and cultural protection works.	Lost ability to seek approval for existing flood works other than access roads, infrastructure protection works, stock refuges and supply channels (above and below ground).	Large scale flood works near high value infrastructure and floodways are likely required to demonstrate that they meet both the standard and the hydraulic assessment criteria to ensure that flooding impacts on neighbouring properties and the environment are minimised or avoided. Existing unapproved flood works may need to be modified to reduce flooding impacts or applications may be refused.¹⁹ Proposals for new flood works may need to be adjusted to minimise or avoid flooding impacts or applications may be refused.	Cost of applying for a flood work approval. Preparation of technical studies including hydraulic modelling is required when the hydraulic assessment criteria apply.	Cost of constructing a flood work approval in accordance with an approval, then maintaining the work at the height and/or scale of the approval.
Stakeholder group impacted	Individual landholders	Individual landholders	Individual landholders	Individual landholders	Individual landholders
Scale: extent & intensity of the impact	Landholder scale: negative, high impact	Landholder scale: negative, medium impact	Landholder scale: negative, medium to high impact	Landholder scale: negative, medium impact	Landholder scale: negative, medium impact
Likelihood & duration of the impact	Landholder scale: medium, permanent impact	Landholder scale: medium, permanent impact	Landholder scale: medium, permanent impact	Landholder scale: medium, temporary (upfront cost) impact	Landholder scale: medium, temporary (upfront cost) impact

¹⁹ In response to landholder feedback in Stage 1 public consultation, a temporary rule has been included in the new FMP to provide a pathway for the approval of existing flood works in management zone B that were constructed prior to 7 July 2000. Unapproved flood works located in management zone B that were constructed prior to 7 July 2000 will be required to meet the standard assessment criteria only, if they are not likely to have significant impacts on nearby high value infrastructure or the environment. This is similar to the rules and assessment criteria for management zone C. More information about this temporary rule in management zone B is provided in section 3.7.2.5 Existing flood works in management zone B.

Factor	Types of new flood works are restricted in Management zone A and SP	Types of existing flood works are restricted in Management zones A and SP	Applicable assessment criteria in management zones B and C	Cost to obtain a flood work approval	Construction and maintenance
External influences	A flood work approval is required regardless of whether an FMP is in place. Flood works in or near floodways are unlikely to be approved anyway. Land capability²⁰ may be influenced by proximity to rivers, creeks and other natural areas. For example, it may flood too often for regular cultivation, and it may not be economically feasible to build flood works. Cultivation may be better placed higher up in the landscape within management zones B or C. Adjusted intensity of the impact: moderate	A flood work approval is required regardless of whether an FMP is in place. Flood works in or near floodways are unlikely to be approved anyway unless the impact on neighbouring properties is minimised. It is not in the public's interest to retrospectively approve existing flood works that may be having a significant impact on neighbouring properties or the environment. Adjusted intensity of the impact: low	A flood work approval is required regardless of whether an FMP is in place. Depends on where in the landscape the works are (or are proposed to be) and the size of the flood works. Works that are further away from high value infrastructure in less developed areas and areas further out on the floodplain are less likely to cause significant impacts and may possibly avoid having to be assessed against the hydraulic assessment criteria. It is not in the public's interest to retrospectively approve existing flood works that may be having a significant impact on neighbouring properties or the environment. Community feedback suggests some existing works are causing localised flooding issues. It is not in the public's interest to approve new flood works that may pose a risk of flooding impacts on neighbouring properties or the environment. Adjusted intensity of the impact: moderate	Cost of application fees is set by WaterNSW. Cost of hydraulic modelling and other technical studies is determined by the market (consultants). Once an application is approved, the ongoing cost is limited to renewal fees (also set by WaterNSW). Adjusted intensity of the impact: low	Cost of construction is determined by the market (either contract earth moving businesses or cost to complete the work if equipment is owned by the landholder). Cost of land surveys to ensure compliance with the approval is determined by the market (consultants). Once a flood work is constructed, maintenance may be limited to prior to or after a flood. Adjusted intensity of the impact: low

²⁰ The NSW Land and soil capability assessment scheme (2017 version 1.5 published December 2023) defines classes based on the biophysical features of the land. These biophysical features determine the on-site and off-site limitations and hazards of the land and include soil type, slope, landform position, acidity, salinity, drainage, rockiness and climate.

5.5.3.1 Benefits of the FMP

There are significant benefits from the implementation of the FMP that are expected to outweigh localised negative impacts. These benefits include:

- Minimising flood impacts on neighbours: the FMP is designed to steer inappropriate development away from high-risk floodways and to minimise changes to flood behaviour in other areas that may cause impacts on neighbouring properties.
- Improved clarity for landholders: Applying a standardised rule set and assessment criteria for flood work applications will make it clearer for landholders and other stakeholders about where flood works can and can't be built.
- Improved flood risk awareness: The proposed floodway network also identifies areas of the floodplain that pose the greatest risk to life and property during times of flood – the main floodways and the extent of historical large flood events. The publication of these maps and an interactive spatial tool will contribute to increased flood risk awareness in the valley and may be used for future property and business planning. For example, an individual landholder may use the mapping to decide which areas are suited to broadacre cropping or grazing depending on the proximity to a floodway; or to identify areas where flood works may be beneficial. This additional knowledge, combined with the proposed rules for flood works may, in turn, assist in reducing some of the production risk associated with agriculture on the floodplain. That is, there may be more certainty that floodwater will not be transferred onto their property as a result of inappropriate flood works being built nearby.
- Supporting coordinated flood preparedness and flood response: The FMP maps and data will be shared with other government agencies that are responsible for flood mitigation and flood response including the NSW State Emergency Service, Local Land Services and local councils. This may contribute to improved flood preparedness and coordinated flood response.
- Cultural benefits: The FMP is designed to protect the passage of floodwater through the floodplain to ensure that flood works do not inadvertently block flow paths to flood-dependent Aboriginal cultural assets and values. The FMP supports their protection and restoration, which in turn provides social and economic benefits to the community. Healthy waterways and floodplains are critical to the culture and wellbeing of Aboriginal people. Water provides food, kinship, connection, recreation, stories, songlines and healing.
- Environmental benefits: Similarly, the FMP is designed to maintain flood-connectivity to ecological assets on the floodplain, including nationally significant wetlands. Protection of ecological assets provides social and economic benefits to the community.

5.5.3.2 Mitigation and management

In developing the FMP, the following measures are applicable to minimise possible impacts on landholders within the proposed floodplain:

- more lenient rules for existing flood works in floodways and areas of special protection (management zones A and SP)
- advertising of flood work applications will not be required within floodways and areas of special protection, and then only for larger scale works within management zone B (inundation extent)

- nearly 80% of the floodplain is proposed to be allocated to management zones B and C where all types of flood works are permitted. This means that, subject to meeting the hydraulic assessment criteria to manage impacts on neighbouring properties, all flood work applications in these areas will be assessed on a case-by-case basis rather than being restricted to a particular type of work
- state-wide exemptions under the Water Management (General) Regulation 2025 apply for some flood works outside of floodways
- sharing spatial data online through the NSW Government's SEED portal to allow for property planning prior to making an application for a flood work approval (possibly avoiding lost time and money on applications that are unlikely to be approved)
- guidance on costs for hydraulic modelling so that landholders may avoid overcharging by private consultancies
- inclusion of amendment provisions to allow the FMP to be updated within its 10-year term if it is in the public's interest.