



New South Wales

## **Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**

under the

**Water Management Act 2000**

I, NIALL BLAIR, the Minister for Regional Water, in pursuance of section 50 of the *Water Management Act 2000*, do, by this Order, make the following Minister's Plan for the Barwon-Darling Valley Floodplain.

Dated this 29<sup>th</sup> day of June 2017.

NIALL BLAIR MLC

**Minister for Regional Water**

### **Explanatory note**

This Order is made under section 50 of the *Water Management Act 2000*.

The object of this Order is to make the *Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017*. The concurrence of the Minister for the Environment was obtained prior to the making of this Order.

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# Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017

## Part 1 Introduction

**Note.** Part 10 of this Plan allows for amendments to be made to this Part.

### 1 Name of Plan

This Plan is the *Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017 (this Plan)*.

### 2 Nature and status of Plan

- (1) This Plan is made under section 50 of the *Water Management Act 2000 (the Act)*.
- (2) This Plan is a plan for floodplain management and generally deals with the matters set out in sections 29 and 30 of the Act, as well as other sections of the Act.

**Notes.**

- 1 Where a provision of this Plan is made under another section of the Act, the section is referred to in the notes to this Plan.
- 2 *Rural Floodplain Management Plans: draft Technical Manual for plans developed under the Water Management Act 2000 (the Technical Manual)* details the methodologies used to develop this Plan.

### 3 Commencement

This Plan commences on 29 June 2017 and is required to be published on the NSW legislation website.

**Note.** In accordance with section 43 of the Act, this Plan will have effect for 10 years from 1 July 2017.

### 4 Application of Plan

This Plan applies to the area within the Barwon-Darling Valley Floodplain shown on the Plan Map called *Floodplain Management Plan Map (FMP015\_Version 1), Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017 (the Plan Map)*.

**Notes.**

- 1 The Barwon-Darling Valley Floodplain is declared to be a **floodplain** under the *Water Management (General) Regulation 2011*. The Dictionary to the Act provides that a floodplain means land declared by the regulations to be a floodplain.
- 2 The Plan Map is part of this Plan. An overview of the Plan Map is shown in Appendix 1. Copies of the Plan Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.

## 5 Management zones

- (1) This Plan establishes the following management zones in the Barwon-Darling Valley Floodplain:

- (a) Barwon-Darling Management Zone A,

**Note.** Barwon-Darling Management Zone A includes major drainage lines and other areas where a significant discharge of floodwater occurs during all flood events. These areas are generally characterised by high flood flow velocity and depth.

- (b) Barwon-Darling Management Zone B,

**Note.** Barwon-Darling Management Zone B includes areas of the floodplain that are important for the conveyance of floodwater during large flood events and for the temporary pondage of floodwaters during the passage of a flood. Its outer boundary is defined by the modelled inundation extent of the large design flood described in Part 4.

- (c) Barwon-Darling Management Zone C,

**Note.** Barwon-Darling Management Zone C contains elevated areas or areas protected by existing flood work development.

- (d) Barwon-Darling Management Zone C for urban areas (***Barwon-Darling Management Zone CU***),

**Note.** Barwon-Darling Management Zone CU contains urban areas where there is either a flood study (FS), a flood risk management study (FRMS), a flood risk management plan (FRMP), or that are protected by flood mitigation works such as town levees.

- (e) Barwon-Darling Management Zone D.

**Note.** Barwon-Darling Management Zone D is a special protection zone for areas of ecological and/or cultural significance. Areas of ecological significance in Barwon-Darling Management Zone D are listed in Schedule 2.

- (2) The management zones in subclause (1) are shown on the map called *Overview of the Management Zones Map (FMP016\_Version 1), Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017 (the Management Zones Map)*.

**Notes.**

- 1 The methodology for delineating management zones is described in the Technical Manual. Information on how the management zones were delineated for this Plan is provided in *Rural Floodplain Management Plans developed under the Water Management Act 2000: Background document to the floodplain management plan for the Barwon-Darling Valley Floodplain 2017 (the Background Document)*.
- 2 The Management Zones Map is part of this Plan. An overview of the Management Zones Map is shown in Appendix 2. Copies of the Management Zones Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.

## 6 Understanding the rules in this Plan

This Plan contains various rules. Where appropriate, the rules specified in this Plan are given effect by the mandatory conditions for flood work approvals contained in Part 9 of this Plan.

## **7 Interpretation**

- (1) Words and expressions that are defined in the Dictionary to this Plan have the meanings set out in the Dictionary.
- (2) Unless otherwise defined in this Plan, words and expressions that are defined in the Act or in the regulations made under the Act have the same meanings in this Plan.
- (3) The Dictionary and Schedules to this Plan form part of this Plan.
- (4) Notes in the text of this Plan do not form part of this Plan.
- (5) Appendices to this Plan do not form part of this Plan.

## **Part 2 Vision, objectives, strategies and performance indicators**

**Note.** This Part is made in accordance with section 35 (1) of the Act.

### **8 Vision statement**

The vision of this Plan is to contribute to a sustainable, healthy and working floodplain by managing the development of new flood works and amendments to existing flood works to protect the passage of floodwater through the floodplain, whilst recognising the need to minimise the risk to life and property.

### **9 Acknowledgement**

Respect is paid to the Traditional Owners of this country, who are acknowledged as the first natural resource managers within this floodplain. In recognition and respect, of the Traditional Owners of this country, this Plan establishes four geographical reaches in the Barwon-Darling Valley Floodplain. Each reach is named after the Traditional Owners of this country. The following provides the name and description of each reach:

(a) Gomeroi Reach

The Gomeroi reach commences from the New South Wales/Queensland border in the vicinity of Mungindi in the north and extends downstream along the Barwon River and adjacent floodplain area to the junction of Dead Man's Creek and the Barwon River.

(b) Euahlayi, Gomeroi and Wayilwan Reach

The Euahlayi, Gomeroi and Wayilwan reach commences from the Gomeroi reach in the north and extends downstream along the Barwon River and adjacent floodplain to the area immediately downstream of the junction of the Big Warrambool and the Barwon River.

(c) Ngemba, Wayilwan, Euahlayi and Baranbinja Reach

The Ngemba, Wayilwan, Euahlayi and Baranbinja reach commences from the Euahlayi, Gomeroi and Wayilwan reach and extends downstream along the Barwon River and adjacent floodplain to the area immediately downstream of the junction of the Culgoa River, Barwon River and Bogan River. This area is also known as "Three ways".

(d) Wangaaypuwan, Ngemba, Baranbinja and Gunu Reach

The Wangaaypuwan, Ngemba, Baranbinja and Gunu reach commences from the Ngemba, Wayilwan, Euahlayi and Baranbinja reach and extends downstream along the Darling River and adjacent floodplain to ‘Weir 21’ located downstream of Louth.

**Notes.**

- 1 Reach naming does not define the area and extent of Traditional Owner Nations and may not reflect all Traditional Owner Nations in the Barwon-Darling Valley Floodplain.
- 2 Reaches are illustrated in the maps provided in Appendices 2 and 4 to 7 in this Plan.

## **10 Objectives**

The objectives of this Plan are to:

- (a) facilitate the orderly passage of floodwaters through the Barwon-Darling Valley Floodplain, and
- (b) minimise the risk to life and property from the effects of flooding, and
- (c) maintain flood connectivity to wetlands, other floodplain ecosystems, and areas of groundwater recharge, and
- (d) contribute to the protection of the ecological assets and values of the Barwon-Darling Valley Floodplain, and
- (e) contribute to the protection of cultural, heritage and spiritual features of the Barwon-Darling Valley Floodplain that are significant to Aboriginal people and other stakeholders.

## **11 Strategies**

The strategies of this Plan are to:

- (a) establish management zones for coordinating flood work development, and
- (b) identify the existing and natural flooding regimes in the area, and
- (c) delineate a floodway network that has adequate hydraulic capacity and continuity to effectively convey floodwaters, and
- (d) identify ecological assets and the ecological benefits of flooding, and
- (e) identify cultural assets and the cultural benefits of flooding, and
- (f) identify existing flood works, and
- (g) establish rules for the granting or amending of flood work approvals.



## **12 Performance indicators**

The following indicators are to be used to measure the success of the strategies to reach the objectives of this Plan:

- (a) the extent to which flood works are impacting on the flood connectivity of ecological and cultural assets and groundwater recharge,
- (b) the change to flood connectivity to ecological and cultural assets caused by flood works constructed after commencement of the Plan,
- (c) the extent to which flood works are modifying the hydraulic behaviour of floodwaters,
- (d) the change to the hydraulic behaviour of floodwater caused by flood works constructed after commencement of the Plan,
- (e) the extent to which the hydraulic behaviour of monitored floods is consistent with the floodway network.

## Part 3 Flooding regimes

### Notes.

- 1 Part 10 of this Plan allows for amendments to be made to this Part.
- 2 This Part is made in accordance with sections 5 (6) and 29 (a) and (b) of the Act.

### 13 General

The provisions in this Part deal with the identification of the existing and natural flooding regimes in the area, in terms of the frequency, duration, nature and extent of flooding.

### 14 Natural flooding regime

- (1) The natural flooding regime in the Barwon-Darling Valley Floodplain was characterised by flood events that occurred prior to the construction of weirs, dams, roads and railways, river regulation, land use changes and floodwork development, both within the Barwon-Darling and throughout the main contributing floodplains such as the Border Rivers, Gwydir, Namoi, and Macquarie.
- (2) A summary of the nature, extent, frequency and duration of the natural flooding regime is provided in Table 1.

**Table 1 — Natural flooding regime**

	Natural flooding regime
<b>Nature</b>	<p>Flooding in the Barwon-Darling River was complex, originating from a number of contributory rivers/streams from Queensland and NSW catchments. The main contributing catchment systems to flooding in the Barwon-Darling included:</p> <ul style="list-style-type: none"> <li>• southern and central Queensland via the Culgoa, Birrie, Bokhara and Warrego Rivers, and</li> <li>• Macintyre and Dumaresq Rivers along the border between Queensland and NSW, and</li> <li>• north-western and central river valleys of NSW including the Gwydir, Namoi, Castlereagh, Macquarie and Bogan Rivers, and</li> <li>• a combination of any or all of the above sources.</li> </ul> <p>The Barwon-Darling River was characterised by low gradients with anabranching floodplain channels. Within this anabranching system water flowed across a broad, low gradient alluvial plain which was contained in a floodplain up to 60 kilometres wide in some sections. The main river channel was complex and varied throughout the floodplain, comprised of deep channels and pools, suspended load depositional benches and higher floodplain benches, braided channels, terminal wetland complexes, gravel beds and riffle zones.</p> <p>From Mungindi to Walgett the Barwon River floodplain was narrow and</p>

	<p>contained a meandering main channel with many in-channel benches. Downstream of Walgett the floodplain widened and floodwaters inundated the alluvial plains. Between Walgett and Bourke there were many anabranches and effluent channels that re-joined the main channel downstream. Downstream of Bourke the Darling River floodplain narrowed with channels becoming incised with relatively few in-channel benches.</p>
<b>Frequency</b>	<p>In its natural state, the Barwon-Darling River was characterised by highly variable and unpredictable patterns of high and low flows. Floods most frequently occurred during summer and winter months.</p> <p>Since official records began, there have been a number of major flood events recorded prior to the construction of major regulating structures on contributing systems that commenced in the 1960s. Between 1864 and 1960 six major flood events have been recorded at Bourke that occurred in 1864, 1890, 1921, 1950, 1955 and 1956. The largest flood recorded at Bourke occurred in 1864 with river gauge heights recorded at 14.52 metres and Annual Exceedance Probability (AEP) of 0.54% (or 1 in 185 AEP). The second highest flood recorded at Bourke occurred in 1890 with river height recorded at 14.40 metres and with AEP of 0.7% (or 1 in 143 AEP).</p>
<b>Duration</b>	<p>Flooding was generally characterised by higher flows with more defined seasonal flood peaks. Flooding could last for weeks to months but in some instances was shorter in duration than floods post-1960s.</p>
<b>Extent</b>	<p>Flood extent was more widespread in many parts of the Barwon-Darling Valley Floodplain, due to greater flood volumes, low channel gradients and absence of water regulating structures and other structures that influenced flood behaviour (e.g. the railway line).</p>

**Note.** *Annual exceedance probability* is defined in the Dictionary.

## 15 Existing flooding regime

- (1) The Barwon-Darling River is largely unregulated, however, the existing flooding regime is characterised by changes since the construction of headwater storages that commenced in the 1960s on tributaries in both NSW and Queensland. This has coincided with river regulation (mainly the construction of weirs and regulators that allow water to be managed for irrigation delivery), land use and vegetation changes and, floodwork development. These changes have affected the nature, frequency, extent and duration of flooding in the Barwon-Darling Valley Floodplain.
- (2) Changes to the nature of flooding include:
  - (a) alteration of the seasonal low flow regime, and
  - (b) reduced frequency and extent of minor and moderate floods, and
  - (c) reduced water quality.
- (3) Generally low flow conditions dominate the Barwon-Darling Valley with major periodic floods interrupting these dry periods.

- (4) Flood duration can range from a few hours to months with some areas of the floodplain, such as deep billabongs adjacent to the main channel, remaining inundated for several years.
- (5) Changes to duration of flooding include a reduction or increase in flooding duration in some flood events due to the changes to the nature of flooding.
- (6) Historical information on the existing flooding regime, including its nature, frequency and extent, was used as part of hydraulic modelling to delineate the floodway network in the following ways:
  - (a) nature: the hydraulic models that simulate the flood behaviour of floodway networks for the floodplain incorporate information that influences the nature of flooding, including the size and roughness of floodways and connections between floodways, along with development on the floodplain. The models represent rivers, streams, overland flow paths and wetlands to simulate the movement of floodwater through the floodplain,
  - (b) frequency: a flood frequency analysis was undertaken to select small and large design floods to simulate flood behaviour when modelling the floodway network. The flood frequency analysis uses flooding information from when the flooding regime was relatively natural, as well as information that encompasses the existing flooding regime,
  - (c) extent: modelled inundation extents of the small and large design floods are represented in the floodway networks.
- (7) The existing flooding regime as captured in the floodway network, including its nature, frequency and extent, was used as the basis for delineating management zones for the floodplain.

## Part 4 Floodway network

### Notes.

- 1 Part 10 of this Plan allows for amendments to be made to this Part.
- 2 This Part is made in accordance with sections 29 and 30 of the Act.

### 16 General

- (1) The provisions in this Part deal with the identification of a floodway network for this Plan.

**Note.** The floodway network is the hydraulic basis for determining the management zones and rules in this Plan. The methodology for delineating the floodway network is described in the Technical Manual. Detail specific to delineating the floodway network for this Plan is provided in the Background Document.

- (2) The floodway network is shown on the map called *Floodway Network Map (FMP017\_Version 1)*, *Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017 (the Floodway Network Map)* held by the Department.

### Notes.

- 1 The Floodway Network Map is part of this Plan. An overview of the Floodway Network Map is shown in Appendix 4. Copies of the Floodway Network Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.
  - 2 The Floodway Network Map represents those areas on the floodplain that have adequate hydraulic capacity and continuity to effectively convey flood waters. It is comprised of:
    - a coordinated and integrated network of floodways where a significant discharge of floodwater occurs during floods, and
    - the inundation extent of small and large design floods, and
    - areas of significant discharge of the large design flood, and
    - areas that preserve floodplain connectivity, and
    - areas that provide sufficient pondage for floodwater.
  - 3 Barwon-Darling Management Zone C and Barwon-Darling Management Zone CU represent those areas within the Plan map that are not part of the floodway network.
- (3) Two hydraulic categories are mapped in the floodway network:
    - (a) floodways, which are areas where a significant discharge of floodwater occurs during design floods, and
    - (b) inundation extent, which includes areas of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.
  - (4) Two design floods were used to model the floodway network:
    - (a) design flood of 1976 (1 in 72 or 1.4% AEP at the Walgett gauging station and 1 in 87 or 1.15% AEP at Bourke gauging station, *the large design flood*), and

- (b) design flood of 2011 (1 in 6 or 17% AEP at the Walgett and Bourke gauging stations, *the small design flood*).
- (5) The floodway network was determined using:
  - (a) hydraulic model outputs:
    - (i) depth-velocity product maps for the large design flood, including:
      - (A) areas that reached the depth-velocity product threshold of  $\geq 0.3 \text{ m}^2/\text{s}$  were categorised as floodways, and
      - (B) flow paths of tributary watercourses that reached the depth-velocity product threshold of  $\geq 0.1 \text{ m}^2/\text{s}$  were categorised as floodways, and
    - Note.** *Depth-velocity product* is defined in the Dictionary.
    - (ii) discharge and velocity values along flow paths, and
    - (iii) inundation extent for the small design flood, and
  - (b) other data:
    - (i) flood aerial photography and satellite imagery, and
    - (ii) spatial watercourse layers and topographical mapping, and
    - (iii) previous rural floodplain management plans and guidelines, and
    - (iv) local knowledge obtained from floodplain communities and floodplain managers.

## **Part 5      Benefits of flooding**

### **Notes.**

- 1      Part 10 of this Plan allows for amendments to be made to this Part.
- 2      This Part is made in accordance with sections 5 (2) and (6) and 29 (b) of the Act.

### **Division 1    General**

#### **17    General**

The provisions in this Part deal with the identification of ecological and cultural assets that benefit from flooding.

### **Division 2    Ecological assets and values dependent on flooding**

#### **18    Ecological benefits of flooding**

The ecological benefits of flooding in the Barwon-Darling Valley Floodplain identified for the purposes of this Plan are:

- (a)    maintaining or improving the structure and condition of habitat for waterbirds, fish and other amphibious fauna, and
- (b)    recharging groundwater reserves and drought refuges, and
- (c)    contributing to nutrient, sediment and carbon cycling, and
- (d)    improving opportunities for floodplain fauna to migrate, reproduce and feed, and
- (e)    supporting recruitment of floodplain vegetation, including flowering, seeding and germination, and
- (f)    suppressing the growth and intrusion of invasive vegetation weed species, and
- (g)    improving wetland ecosystem resilience.

#### **19    Ecological assets**

- (1)    The types of ecological assets identified for the purposes of this Plan are:

- (a)    wetlands:
  - (i)    semi-permanent (non-woody), and
  - (ii)   floodplain (woody), and
- (b)    other floodplain ecosystems:

- (i) flood-dependent forest, and
  - (ii) flood-dependent woodland, and
  - (iii) floodplain watercourses, and
  - (iv) non flood-dependent vegetation communities that provide habitat for flood-dependent fauna, and
- (c) likely areas of groundwater recharge:
  - (i) alluvial soils, and
  - (ii) rivers and watercourses, and
  - (iii) vegetation communities that are associated with groundwater recharge.

**Note.** The nature of groundwater recharge is complex and recharge may occur in areas other than those listed in paragraph (c).

- (2) The types of ecological assets in subclause (1) are described in detail in Schedule 1.
- (3) Areas of ecological assets are shown on the map called *Ecological Assets Map (FMP018\_Version 1)*, *Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017 (the Ecological Assets Map)* held by the Department.

**Note.** The Ecological Assets Map is part of this Plan. An overview of the Ecological Assets Map is shown in Appendix 5. Copies of the Ecological Assets Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.

## 20 Ecological values

- (1) The ecological values identified for the purposes of this Plan are:
  - (a) areas of state and international conservation significance, and
  - (b) habitat for flood-dependent fauna, and
  - (c) floodplain vegetation and fauna species, including threatened species.
- (2) The ecological values in subclause (1) are listed in detail in Schedule 1.

**Notes.**

- 1 ***Ecological assets***, ***ecological values*** and ***flood-dependent assets*** are defined in the Dictionary.
- 2 Further information is provided in the Background Document on how ecological values were used as surrogates for biodiversity to prioritise the ecological assets.

## Division 3 Cultural assets and values dependent on flooding

### 21 Aboriginal values

- (1) The Aboriginal values that have been identified for the purposes of this Plan are the
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flood-dependent assets described in subclause (2). The functions, services and features identified as benefiting Aboriginal people and their cultures described in subclause (3) are listed in one of the following:

- (a) Aboriginal Heritage Information Management System,
  - (b) Aboriginal Water Initiative System,
  - (c) Murray Darling Basin Authority Aboriginal Submissions Database,
  - (d) NSW State Heritage Register,
  - (e) Commonwealth Heritage Register,
  - (f) any other source or database that has been deemed relevant by the Minister.
- (2) Aboriginal values that have been identified as flood-dependent assets for the purposes of this clause are:
- (a) places or sites that are, or could be, used for cultural activities and that benefit from flooding, such as fish traps made of stone or sticks, and
  - (b) flood-dependent ecological assets that:
    - (i) are recognised for their spiritual and/or cultural significance, or
    - (ii) have been culturally modified, including:
      - (A) scarred trees, and
      - (B) tree carvings, or
    - (iii) are or contain resources that are or were utilised in cultural activities, or
    - (iv) are associated with places that are used for contemporary cultural activities.
- (3) Aboriginal values involving the following functions, services and features identified as benefitting Aboriginal people and their cultures for the purposes of this clause are:
- (a) Aboriginal cultural processes that are dependent on flooding, including:
    - (i) harvesting traditional flood-dependent resources, and
    - (ii) cultural activities connected with and dependent upon flood events,
  - (b) continuation of Aboriginal cultural practices connected with flooding,
  - (c) preservation and longevity of Aboriginal values,
  - (d) maintaining potential for cultural renewal,

- (e) maintaining spiritual connection with the floodplain landscape.

**Notes.**

- 1 **Aboriginal values** is defined in the Dictionary.
- 2 Details on the identification and cultural assessment of the Aboriginal values identified in subclause (2) are described in the Background Document.
- 3 For an Aboriginal site to be identified in this clause for the purposes of this Plan, it has to be listed in a source described in subclause (1). Aboriginal sites identified as part of this planning process were added to the relevant source.

## 22 Heritage sites

Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the following:

- (a) NSW State Heritage Register,
- (b) NSW State Heritage Inventory,
- (c) Aboriginal Heritage Information Management System,
- (d) Murray Darling Basin Authority Aboriginal Submissions Database,
- (e) Historic Heritage Information Management System,
- (f) DPI Water's Aboriginal Water Initiative System,
- (g) Commonwealth Heritage Register,
- (h) any other source or database that has been deemed relevant by the Minister,

where the heritage value of the listing is associated with flooding.

**Note.** Heritage sites may be sensitive to changes in flood behaviour or disturbance from the construction of flood works. Where a heritage site is located within the area of a flood work application it will be assessed against criteria to ensure these sites are not adversely impacted.

## Part 6 Existing flood works

### Notes.

- 1 Part 10 of this Plan allows for amendments to be made to this Part.
- 2 This Part is made in accordance with sections 5 (2) (e)–(g) and (6), 29 (c) and 30 (b)–(d) of the Act.

### 23 General

The provisions in this Part deal with the identification of existing flood works in the area and the way they are managed, their benefits in terms of the protection they give to life and property, and their cultural, socio-economic and ecological impacts, including cumulative impacts.

### 24 Types of flood works

The following types of flood works are present in the Barwon-Darling Valley Floodplain:

- (a) access roads,
- (b) cultural, ecological and heritage site enhancement works,
- (c) infrastructure protection works,
- (d) levees,
- (e) storages,
- (f) stock refuge works,
- (g) supply channels,
- (h) other earthworks and embankments.

**Note.** *Infrastructure protection work* is defined in the Dictionary.

### 25 Approved flood works

At the commencement of this Plan, 44 flood works were approved in the Barwon-Darling Valley Floodplain. The types of approved flood works include:

- (a) above ground channels, and
- (b) levees and embankments, and
- (c) storages.

**Note.** A single approval may be comprised of numerous individual works. Some structures can be used for other purposes, for example, levees and embankments can also be used as roads or infrastructure protection works.

## **26 Area enclosed by existing flood works**

- (1) At the commencement of this Plan, the area shown on the Plan Map, enclosed by flood works is estimated to be 45,900 hectares.
- (2) The area enclosed by existing flood works is shown on the map called *Existing Flood Works Map (FMP019\_Version 1)*, *Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017 (the Existing Flood Works Map)* held by the Department.

### **Notes.**

- 1 The Existing Flood Works Map is part of this Plan. An overview of the Existing Flood Works Map is shown in Appendix 6. Copies of the Existing Flood Works Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.
- 2 The Existing Flood Works Map depicts the overall footprint of major works constructed in the area shown on the Plan Map and the major areas enclosed by those works. The map does not depict individual works, and it does not include all works in the area.

## **27 Ecological impacts of flood works**

- (1) The positive impacts of existing flood works on ecological assets identified in clause 19 in relation to flood behaviour and flood connectivity can include:
  - (a) increased localised flooding frequency and duration (due to the diversion and retention of floodwaters) for ecological assets when flooding regimes have generally been reduced by river regulation, and
  - (b) increased localised groundwater recharge due to the diversion and retention of floodwaters in areas where groundwater recharge is generally restricted by altered flooding regimes.
- (2) The negative impacts of existing flood works on ecological assets identified in clause 19 in relation to flood behaviour and flood connectivity can include:
  - (a) altered flood connectivity, which may result in:
    - (i) disconnection of ecological assets from flooding by blocking or partially obstructing flow paths, and
    - (ii) diversion of flood flows away from ecological assets, and
    - (iii) increased flooding duration of ecological assets that exceeds the requirements of floodplain species, and
    - (iv) decline in available forage, nesting and refuge habitat for fauna reliant on ecological assets, and
  - (b) restricted native fish passage, which may result in:

- (i) reduction of fish migration within the floodplain, and
- (ii) fish becoming stranded by existing flood works on the floodplain when floodwaters recede, and
- (iii) reduced access to habitat and food resources during floods, and
- (iv) decline in the abundance and distribution of native fish, and
- (c) reduction in groundwater recharge during floods as extent and duration of flooding is reduced, and
- (d) net reduction of floodwater available to ecological assets as a result of river regulation and existing flood works.

## **28 Cultural impacts of flood works**

- (1) The positive impact of existing flood works on cultural assets identified in clauses 21 and 22 in relation to flood behaviour and flood connectivity can include increased localised flooding frequency and duration (due to the diversion and retention of floodwaters) for flood-dependent cultural places with flooding regimes reduced by river regulation.
- (2) The negative impacts of existing flood works on cultural assets identified in clauses 21 and 22 in relation to flood behaviour, flood risk and flood connectivity can include:
  - (a) altered flood connectivity to cultural assets, which may result in:
    - (i) disconnection of flood-dependent cultural assets from flooding by flows blocking or partially obstructing flow paths, and
    - (ii) diversion of flood flows away from flood-dependent cultural assets, and
    - (iii) increased flooding duration of flood-dependent cultural assets that exceeds the requirements of those assets, and
  - (b) increase in flood velocity, which may result in scour and erosion damage to cultural places, such as burial sites.

## **29 Socio-economic impacts of flood works**

- (1) The positive impacts of existing flood works on socio-economic factors in relation to flood behaviour and flood risk can include:
    - (a) flood protection of crops and property, and
    - (b) flood protection for on-farm access, and
    - (c) infrastructure for managing irrigation or stock and domestic water.
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- (2) The negative impacts of existing flood works on socio-economic factors in relation to flood behaviour, flood risk and flood connectivity are redistribution of flood flows and altered flood behaviour which may result in:
  - (a) re-direction of flood flows onto adjacent properties, and
  - (b) increase in flood velocity leading to increased erosion and scour, and
  - (c) increase in flood levels on adjacent and downstream properties, and
  - (d) disruptions to daily life, for instance limited or no property access during floods, and
  - (e) loss of crops and infrastructure.

### **30 Cumulative impacts of flood works**

- (1) This Plan recognises the positive socio-economic, cultural and ecological impacts of existing flood works where they are constructed in a coordinated manner, but also recognises that cumulative negative impacts of flood works can occur where their construction is uncoordinated.
- (2) This Plan addresses the potential negative cumulative impacts of existing and proposed flood works through:
  - (a) identifying existing flood works in the Barwon-Darling Valley Floodplain for use in the hydraulic modelling of different floodplain scenarios, and
  - (b) using hydraulic modelling to compare undeveloped floodplain scenarios to existing developed floodplain conditions, in order to understand the cumulative impacts of existing flood works across the floodplain, and
  - (c) developing management zones and rules for granting and amending flood work approvals in consideration of the cumulative impacts additional flood works may have across the floodplain.

**Note.** The mechanisms used by the Plan to address cumulative impacts are interrelated. For instance, hydraulic modelling shows that, taking account of identified existing works, the construction of new flood works in major discharge areas would have a significant cumulative impact on the distribution of flow and flood levels. These areas are represented by Management Zones A and D where only minimal flood work development is permitted.

## **Part 7      Risks from flooding**

**Note.** This Part is made in accordance with sections 5 (6) and 29 (d) of the Act.

### **31      General**

The provisions in this Part deal with the risk to life and property from the effects of flooding.

### **32      Risk to life and property**

Risk to life and property from the effects of flooding includes, but is not limited to:

- (a) the risk of tangible flood damage, which is financial in nature, including:
  - (i) the damage or loss caused by floodwaters wetting goods, possessions and crops, and
  - (ii) property damage, which includes contents damage (e.g. carpets and furniture), structural damage (e.g. wall, floors and windows) and external damage (e.g. high value infrastructure and parked motor vehicles), and
  - (iii) the loss of livestock, and
  - (iv) the loss of wages and extra outlays incurred during clean-up operations, and

**Note.** *High value infrastructure* is defined in the Dictionary.

- (b) the risk of intangible flood damage, including:
  - (i) increased levels of emotional stress, and
  - (ii) mental and physical illness caused by the flood episode, and
  - (iii) disruption to daily life, such as restricted or no access to property.

### **33      Consideration of risk to life and property**

The risk to life and property from the effects of flooding is addressed in this Plan in Parts 4, 6, and 8.

### **34      The floodway network**

The floodway network addresses the risk to life and property through:

- (a) identification of areas within the floodway network that may impact on life and property, such as:
  - (i) major flood discharge areas, and

- (ii) areas of the floodplain that are subject to inundation during times of flooding, and
- (b) flood risk awareness, through:
  - (i) mapping of floodways, and
  - (ii) mapping the extent of modelled historic flood flows.

### **35 Management zones and rules for granting or amending flood work approvals**

- (1) The risk to life and property from the effects of flooding is addressed in the design of the management zones and the rules for granting or amending flood work approvals by:
  - (a) identifying hydraulic thresholds within management zones where the local and cumulative impact of flood work development should be limited to prevent flood flow redistribution, increased flood velocities and flood levels, and
  - (b) developing rules to limit the granting of flood work approvals for flood works that are minor in nature, including flood protection works to protect infrastructure and livestock, in zones where major flood discharge occurs (Barwon-Darling Management Zones A and D), and
  - (c) developing rules to allow landholders to apply for certain flood protection works in Barwon-Darling Management Zone B (where temporary storage of large floods occurs) without requiring advertising, to protect infrastructure, crops and livestock from flood events, and
  - (d) specifying the nature of flood works that can be constructed.
- (2) The implementation of the management zones and rules for granting or amending flood work approvals will minimise flood risk by:
  - (a) coordinating and controlling the type and nature of flood work development, and
  - (b) preventing the construction of flood works that pose a significant risk to property, and
  - (c) increasing flood risk awareness and informing land use planning through mapping of management zones that highlight areas subject to frequent inundation (Barwon-Darling Management Zones A and D).

### **36 Existing works**

The risk to life and property from the effects of flooding was considered through the identification of existing flood works by:

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- (a) consideration of existing flood works in the delineation of the floodway network and the design of the management zones, and
- (b) identification of areas within the floodplain where cumulative impacts from existing works may be high, and
- (c) limiting floodwork development in parts of the floodplain where cumulative impacts are high, and
- (d) adoption of cumulative impact assessment thresholds that take into account existing flood work development.

## **Part 8 Rules for granting or amending flood work approvals**

### **Notes.**

- 1 Part 10 of this Plan allows for amendments to be made to this Part.
- 2 Rules for flood work approvals in this Part are made in accordance with sections 5, 29, 30 and 95 of the Act.

### **Division 1 General**

#### **37 General**

- (1) The rules in this Part apply to granting or amending flood work approvals for flood works in the Barwon-Darling Valley Floodplain.
- (2) Where a flood work approval is sought for a flood work that is located or is proposed to be located in more than one management zone, the rules in each of the management zones in which the work is located apply only to that portion of the work located within the management zone.

### **Division 2 Rules for granting or amending flood work approvals in Barwon-Darling Management Zone A**

#### **38 Flood works authorised in Barwon-Darling Management Zone A**

- (1) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone A unless, in the Minister's opinion, the flood work approval is for one of the following:
  - (a) an access road,
  - (b) a supply channel,
  - (c) a stock refuge,
  - (d) an infrastructure protection work,
  - (e) an ecological enhancement work,
  - (f) an Aboriginal value enhancement work,
  - (g) a heritage site enhancement work.
- (2) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of an access road in Barwon-

Darling Management Zone A unless, in the Minister's opinion, the access road is or is proposed to be either:

- (a) no more than 50 cm in height above the natural surface level at any location, or

**Note. *Natural surface level*** is defined in the Dictionary

- (b) a primary access road no more than 100 cm in height above the natural surface level at any location,

**Note. *Primary access road*** is defined in the Dictionary.

and is constructed

- (c) in such a way as to allow for the adequate passage of floodwater and to adequately prevent the diversion of floodwater from natural flow paths, and

**Note.** The Minister may require structures to be put in place at low points of the access road to meet the requirements of this paragraph.

- (d) so that the borrow associated with the construction and maintenance of the access road is located on the downstream side of the road and is of no greater depth than 50 cm below the natural surface level.

**Note. *Borrow*** is defined in the Dictionary.

- (3) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of a supply channel in Barwon-Darling Management Zone A unless, in the Minister's opinion, the supply channel is or is proposed to be constructed:

- (a) below the natural surface level, and

- (b) in such a way as to allow for the adequate passage of floodwater and to adequately prevent the diversion of floodwater from natural flow paths, and

**Note.** The Minister may require that a structure be put in place at a low point of the supply channel to meet the requirements of this paragraph.

- (c) so that spoil from its construction and maintenance:

- (i) is windrowed parallel to the direction of flow such that it does not block more than 5% of the width of Barwon-Darling Management Zone A at the location where the work is being constructed, or

- (ii) is levelled to a maximum of 10 cm above the natural surface level at any location.

**Note. *Windrow*** is defined in the Dictionary.

- (4) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of a stock refuge in Barwon-Darling Management Zone A unless, in the Minister's opinion, the stock refuge is or is proposed to be no more than:
- (a) 10 ha in area in any single location within Barwon-Darling Management Zone A, and
  - (b) 5% of the total area of the landholding, and
  - (c) 5% of the width of Barwon-Darling Management Zone A measured at the location of the works.
- (5) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of an infrastructure protection work on a landholding of less than or equal to 20 ha in area in Barwon-Darling Management Zone A unless, in the Minister's opinion, the area enclosed by the infrastructure protection work accounts for no more than 10% of the total area of the landholding.

**Notes.**

- 1 **Infrastructure protection work** is defined in the Dictionary.
  - 2 For example, if a landholding is 10 ha in area, the infrastructure protection work must enclose no more than 1 ha.
- (6) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of an infrastructure protection work on a landholding of greater than 20 ha in area in Barwon-Darling Management Zone A unless, in the Minister's opinion, the area enclosed by the infrastructure protection work accounts for no more than the greater of the following:
- (a) 2 ha, or
  - (b) 1% of the total landholding.
- Note.** For example, if a property is 25 ha in area, the area enclosed by infrastructure protection works must be no more than 2 ha in area. A property that is 300 ha in area may have infrastructure protection works that enclose an area no more than 3 ha in area.
- (7) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of an infrastructure protection work in Barwon-Darling Management Zone A if, in the Minister's opinion, it would block more than 5% of the width of Barwon-Darling Management Zone A at the location of the works.

- (8) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of an ecological enhancement work in Barwon-Darling Management Zone A unless, in the Minister's opinion, the ecological enhancement work is or is proposed to provide a positive outcome for an ecological asset that is mapped, recognised in or protected by this Plan, or local, state or Commonwealth environmental policy or legislation.

**Note. *Ecological enhancement work*** is defined in the Dictionary.

- (9) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of an Aboriginal value enhancement work in Barwon-Darling Management Zone A unless, in the Minister's opinion, the Aboriginal value enhancement work is or is proposed to provide a positive outcome for an Aboriginal value asset that is listed in one of the following:

- (a) Aboriginal Heritage Information Management System,
- (b) Aboriginal Water Initiative System,
- (c) Murray Darling Basin Authority Aboriginal Submissions Database,
- (d) NSW State Heritage Register,
- (e) Commonwealth Heritage Register,
- (f) any other source or database deemed relevant by the Minister.

**Note. *Aboriginal value enhancement work*** is defined in the Dictionary.

- (10) Subject to subclause (1) and clause 40, a flood work approval must not be granted or amended to authorise the construction or modification of a heritage site enhancement work in Barwon-Darling Management Zone A unless, in the Minister's opinion, the heritage site enhancement work is or is proposed to provide a positive outcome for a heritage site asset that is listed in one of the following:

- (a) Aboriginal Heritage Information Management System,
- (b) Aboriginal Water Initiative System,
- (c) Murray Darling Basin Authority Aboriginal Submissions Database,
- (d) NSW State Heritage Register,
- (e) NSW State Heritage Inventory,
- (f) Historic Heritage Information Management System,
- (g) Commonwealth Heritage Register,

- (h) any other source or database deemed relevant by the Minister.

**Note.** *Heritage site enhancement work* is defined in the Dictionary.

### **39 Existing flood works in Barwon-Darling Management Zone A**

- (1) A flood work approval in Barwon-Darling Management Zone A may be granted for a flood work that does not comply with the requirements of clause 38, provided the flood work meets all of the following criteria:
  - (a) the flood work was constructed as at the date of commencement of this Plan,
  - (b) the flood work is, in the Minister's opinion, for:
    - (i) an access road, or
    - (ii) a supply channel, or
    - (iii) a stock refuge, or
    - (iv) an infrastructure protection work,
  - (c) as at the date of application, the flood work is not the subject of:
    - (i) an undetermined controlled work application under Part 8 of the *Water Act 1912*, or
    - (ii) a previously refused Part 8 application of the *Water Act 1912*, or
    - (iii) an undetermined flood work application under the Act, or
    - (iv) a previously refused flood work application under the Act.
- (2) An amendment of a flood work approval in Barwon-Darling Management Zone A may be granted for a flood work that does not comply with the requirements of clause 38, provided the flood work meets all of the following criteria:
  - (a) the flood work was constructed as at the date of commencement of this Plan,
  - (b) the proposed modification to the flood work will, in the Minister's opinion, reduce the impact of the work on flow patterns (distribution of flows, drainage, depth or velocity) in Barwon-Darling Management Zone A.
- (3) An application under this clause must be assessed against the assessment criteria outlined in clause 40 of this Plan.

### **40 Assessment criteria for flood works in Barwon-Darling Management Zone A**

**Note.** The Minister may require applicants for flood work approvals to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

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- (1) Flood work applications in Barwon-Darling Management Zone A must be assessed against the assessment criteria outlined in this clause.
- (2) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone A unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity to:
  - (a) ecological assets, and
  - (b) facilitate fish passage,under a range of flood scenarios, including at a minimum, scenarios for the large and small design floods.
- (3) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone A unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity to:
  - (a) Aboriginal values, and
  - (b) heritage sites,under a range of flood scenarios, including at a minimum, scenarios for the large and small design floods.
- (4) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone A if, in the Minister's opinion, the construction of the flood work is likely to disturb the ground surface of a heritage site or cause more than minimal erosion to a heritage site.

**Note.** Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the sources referred to in clause 22.
- (5) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone A unless, in the Minister's opinion, the flood work can be constructed to maintain adequate drainage on adjacent landholdings and other landholdings that may be affected by the proposed flood work.
- (6) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone A unless the Minister has considered the cumulative impact that the proposed flood work and other existing works on the landholding may have on adjacent landholdings, and on other

landholdings that may be affected by the proposed flood work and the floodplain environment.

**Note.** In conducting the assessments described under subclauses (2), (3) and (6), the Minister may consider any flood scenario that is appropriate to the flood work that is proposed and its location on the floodplain.

### **Division 3 Rules for granting or amending flood work approvals in Barwon-Darling Management Zone B**

#### **41 Advertising for flood work approvals in Barwon-Darling Management Zone B**

An application for a new or amended flood work approval in Barwon-Darling Management Zone B must be advertised, unless the flood work is or is proposed to be:

- (a) no more than a maximum height of 80 cm above the natural surface level at any location, or
- (b) used as a stock refuge, and:
  - (i) accounts for no more than 5% of the total area of the landholding, and
  - (ii) is no more than 10 ha in size in any single location in Barwon-Darling Management Zone B, or
- (c) used to protect infrastructure and the area enclosed by the flood work accounts for no more than 1% of the total area of the landholding.

#### **42 Assessment criteria in Barwon-Darling Management Zone B**

**Note.** The Minister may require applicants for flood work approvals to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) Flood work applications in Barwon-Darling Management Zone B that do not require advertising in accordance with clause 41 do not require assessment against subclauses (6) – (8) unless required by the Minister. All other flood work applications in Barwon-Darling Management Zone B must be assessed against the assessment criteria outlined in this clause.

**Note.** In determining whether to grant or amend a flood work approval to authorise the construction of a flood work in Barwon-Darling Management Zone B that does not require advertising in accordance with clause 41, the Minister may conduct the assessments described in subclauses (6) – (8).

- (2) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone B unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity to:
  - (a) ecological assets, and



- (b) facilitate fish passage,  
  
under a range of flood scenarios including, at a minimum, scenarios for the 1976 and 2011 design floods.
- (3) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone B unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity to:
  - (a) Aboriginal values, and
  - (b) heritage sites,  
  
under a range of flood scenarios, including at a minimum, scenarios for the 1976 and 2011 design floods.
- (4) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone B if, in the Minister's opinion, the construction of the flood work is likely to disturb the ground surface of a heritage site or cause more than minimal erosion to a heritage site.

**Note.** Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the sources referred to in clause 22.
- (5) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone B unless, in the Minister's opinion, the flood work can be constructed to maintain adequate drainage on adjacent landholdings and other landholdings that may be affected by the proposed flood work.
- (6) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone B if, in the Minister's opinion, construction of the flood work is likely to:
  - (a) redistribute the peak flood flow by more than 5% on adjacent landholdings and other landholdings that may be affected by the proposed flood work when compared to the peak flood flow under existing development conditions for a range of flood scenarios including, at a minimum the large design flood, or
  - (b) increase flood levels by more than or equal to 20 cm on adjacent landholdings and other landholdings that may be affected by the proposed flood work when compared to flood levels under pre-development and existing development conditions for a range of flood scenarios, including at a minimum the large design

flood, or

- (c) increase flow velocity by more than 50% on the landholding under application, adjacent landholdings and other landholdings that may be affected by the proposed flood work when compared to flow velocity under pre-development and existing development conditions for a range of flood scenarios, including at a minimum the large design flood, unless:
  - (i) increases of more than 50% are in isolated areas where the landholder mitigates the impact on the flood wave so that the average impact across the landholding under application is no greater than 50%, and
  - (ii) flow velocity is not increased by more than 50% at the boundary of the landholding under application, or
- (d) increase flood levels such that they impact high value infrastructure when compared to flood levels under pre-development and existing development conditions for a range of flood scenarios, including at a minimum the large design flood, or
- (e) increase flow velocity by an amount that, in the Minister's opinion, is likely to have more than a minimal impact on soil erodibility on the landholding under application, adjacent landholdings and other landholdings that may be affected by the proposed flood work, taking into account the ground cover on those landholdings.

**Note.** *Pre-development conditions* and *existing development conditions* are defined in the Dictionary.

- (7) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone B if, in the Minister's opinion, construction of the flood work is likely to redistribute the peak flood flow by more than 5% at any of the Peak Discharge Calculation Points shown on the map called *Peak Flood Flow Distribution (1976) Map (FMP020\_Version 1)*, *Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017 (the Peak Flood Flow Distribution (1976) Map)* under existing development conditions.

**Note.** The Peak Flood Flow Distribution (1976) Map is part of this Plan. An overview of the Peak Flood Flow Distribution (1976) Map is shown in Appendix 7. Copies of the Peak Flood Flow Distribution (1976) Map may be inspected at the offices listed in Appendix 3 and are available on the NSW legislation website.

- (8) In addition to the requirements of subclause (7), a flood work approval must not be granted or amended to authorise the construction of a flood work in Barwon-Darling

Management Zone B if, in the Minister's opinion, the construction of the flood work would be likely to redistribute the peak flood flow under existing development conditions by more than 5% at any location and under any other flood scenario considered relevant by the Minister.

**Note.** In conducting the assessments described under subclauses (2), (3) and (6) – (8), the Minister may consider any flood scenario that is appropriate to the flood work that is proposed and its location on the floodplain, including the large design flood under existing and/or pre-development conditions, the 1% AEP flood under existing and/or pre-development conditions, or any other relevant flood scenario.

## **Division 4 Rules for granting or amending flood work approvals in Barwon-Darling Management Zone C**

### **43 Assessment criteria in Barwon-Darling Management Zone C**

**Note.** The Minister may require applicants for flood work approvals to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) Flood work applications in Barwon-Darling Management Zone C must be assessed against the assessment criteria outlined in this clause.
- (2) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone C unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity to:
  - (a) ecological assets, and
  - (b) facilitate fish passage,under a range of flood scenarios including, at a minimum, scenarios for the large and small design floods.
- (3) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone C unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity to:
  - (a) Aboriginal values, and
  - (b) heritage sites,under a range of flood scenarios, including at a minimum, scenarios for the 1976 and 2011 design floods.

- (4) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone C if, in the Minister's opinion, the construction of the flood work is likely to disturb the ground surface of a heritage site or cause more than minimal erosion to a heritage site.

**Note.** Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the sources referred to in clause 22.

- (5) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone C unless, in the Minister's opinion, the flood work can be constructed to maintain adequate drainage on adjacent landholdings and other landholdings that may be affected by the proposed flood work.
- (6) In determining whether to grant or amend a flood work approval to authorise the construction or modification of a flood work in Barwon-Darling Management Zone C, the Minister may have regard to whether construction of the flood work would be likely to:
- (a) redistribute the peak flood flow by more than 5% on adjacent landholdings and other landholdings that may be affected by the proposed flood work when compared to the peak flood flow under existing development conditions for one or more flood scenarios, or
  - (b) increase flood levels by more than or equal to 20 cm on adjacent landholdings and other landholdings that may be affected by the proposed flood when compared to flood levels under pre-development and existing development conditions under one or more flood scenarios, or
  - (c) increase flow velocity by more than 50% on the landholding under application, adjacent landholdings and other landholdings that may be affected by the proposed flood work when compared to flow velocity under pre-development and existing development conditions under one or more flood scenarios, unless:
    - (i) increases by more than 50% are in isolated areas where the landholder mitigates the impact on the flood wave so that the average impact across the landholding under application is no greater than 50%, and
    - (ii) flow velocity is not increased by more than 50% at the boundary of the landholding under application, or
  - (d) increase flow velocity by an amount that, in the Minister's opinion, is likely to have more than a minimal impact on soil erodibility on the landholding under

application, adjacent landholdings and other landholdings that may be affected by the proposed flood work, taking into account the ground cover on those landholdings, or

- (e) increase flood levels such that they impact high value infrastructure when compared to flood levels under pre-development and existing development conditions under one or more flood scenarios.
- (7) In determining whether to grant or amend a flood work approval to authorise the construction or modification of a flood work in Barwon-Darling Management Zone C, the Minister may have regard to whether construction of the flood work would be likely to redistribute the peak flood flow by more than 5% under existing development conditions at any of the Peak Discharge Calculation Points shown in the Peak Flood Flow Distribution (1976) Map at any location and at any other flood scenario considered relevant by the Minister.

**Note.** In conducting the assessments described under subclauses (2), (3), (6) and (7), the Minister may consider any flood scenario that is appropriate to the flood work that is proposed and its location on the floodplain, including the 1976 design flood under existing and/or pre-development conditions, the 1% AEP flood under existing and/or pre-development conditions, or any other relevant flood scenario.

## **Division 5 Rules for granting or amending flood work approvals in Barwon-Darling Management Zone CU**

### **44 Assessment criteria in Barwon-Darling Management Zone CU**

**Note.** The Minister may require applicants for flood work approvals to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

Flood work applications in Barwon-Darling Management Zone CU must be assessed against the assessment criteria outlined in clause 43.

## **Division 6 Rules for granting or amending flood work approvals in Barwon-Darling Management Zone D**

### **45 Flood works authorised in Barwon-Darling Management Zone D**

**Note.** The Minister may require applicants for flood work approvals to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) A flood work approval must not be granted or amended to authorise the construction or modification of an ecological enhancement work in Barwon-Darling Management Zone D unless, in the Minister's opinion, the ecological enhancement work is or is proposed to

provide a positive outcome for an ecological asset that is mapped, recognised in or protected by this Plan, or local, state or Commonwealth environmental policy or legislation.

- (2) A flood work approval must not be granted or amended to authorise the construction or modification of an Aboriginal value enhancement work in Barwon-Darling Management Zone D unless, in the Minister's opinion, the Aboriginal value enhancement work is or is proposed to provide a positive outcome for an Aboriginal value asset that is listed in one of the following:
  - (a) Aboriginal Heritage Information Management System,
  - (b) Aboriginal Water Initiative System,
  - (c) Murray Darling Basin Authority Aboriginal Submissions Database,
  - (d) NSW State Heritage Register,
  - (e) Commonwealth Heritage Register,
  - (f) any other source or database deemed relevant by the Minister.
- (3) A flood work approval must not be granted or amended to authorise the construction or modification of a heritage site enhancement work in Barwon-Darling Management Zone D unless, in the Minister's opinion, the heritage site enhancement work is or is proposed to provide a positive outcome for a heritage site asset that is listed in one of the following:
  - (a) Aboriginal Heritage Information Management System,
  - (b) Aboriginal Water Initiative System,
  - (c) Murray Darling Basin Authority Aboriginal Submissions Database,
  - (d) NSW State Heritage Register,
  - (e) NSW State Heritage Inventory,
  - (f) Historic Heritage Information Management System,
  - (g) Commonwealth Heritage Register,
  - (h) any other source or database deemed relevant by the Minister.

#### **46 Existing flood works in Barwon-Darling Management Zone D**

- (1) A flood work approval in Barwon-Darling Management Zone D may be granted for a flood work that does not comply with the requirements of clause 45, provided the flood work meets all of the following criteria:
  - (a) the flood work was constructed as at the date of commencement of this Plan,
  - (b) the flood work is, in the Minister's opinion, for:
    - (i) an infrastructure protection work, or
    - (ii) a stock refuge, or
    - (iii) an access road, or
    - (iv) a supply channel,
  - (c) as at the date of application, the flood work is not the subject of:
    - (i) an undetermined controlled work application under Part 8 of the *Water Act 1912*, or
    - (ii) a previously refused Part 8 application of the *Water Act 1912*, or
    - (iii) an undetermined flood work application under the Act, or
    - (iv) a previously refused flood work application under the Act.
- (2) An amendment of a flood work approval in Barwon-Darling Management Zone D may be granted for a flood work that does not comply with the requirements of clause 45, provided the flood work meets all of the following criteria:
  - (a) the flood work was constructed as at the date of commencement of this Plan, and
  - (b) the proposed modification to the flood work will, in the Minister's opinion, reduce the impact of the work on flow patterns (distribution of flows, drainage, depth or velocity) in Barwon-Darling Management Zone D.
- (3) An application under this clause must be assessed against the assessment criteria outlined in clause 47 of this Plan.

#### **47 Assessment criteria in Barwon-Darling Management Zone D**

**Note.** The Minister may require applicants for flood work approvals to submit technical studies or supporting information to demonstrate that a flood work or proposed flood work meets the criteria outlined in this clause.

- (1) Flood work applications in Barwon-Darling Management Zone D must be assessed against the assessment criteria outlined in this clause.
-

- (2) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone D unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity to:
- (a) ecological assets, and
  - (b) facilitate fish passage,
- under a range of flood scenarios including, at a minimum, scenarios for the large and small design floods.
- (3) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone D unless, in the Minister's opinion, the flood work can be constructed to maintain adequate flood connectivity to:
- (a) Aboriginal values, and
  - (b) heritage sites,
- under a range of flood scenarios, including at a minimum, scenarios for the small and large design floods.
- (4) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone D if, in the Minister's opinion, the construction of the flood work is likely to disturb the ground surface of a heritage site or cause more than minimal erosion to a heritage site.
- Note.** Heritage sites that have been identified as flood-dependent assets for the purposes of this Plan are sites, objects or places listed in at least one of the sources referred to in clause 22.
- (5) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone D unless, in the Minister's opinion, the flood work can be constructed to maintain adequate drainage on adjacent landholdings and other landholdings that may be affected by the proposed flood work.
- (6) A flood work approval must not be granted or amended to authorise the construction or modification of a flood work in Barwon-Darling Management Zone D unless the Minister has considered the cumulative impact that the proposed flood work and other existing works on the landholding may have on adjacent landholdings, other landholdings and the floodplain environment.

**Note.** In conducting the assessments described under subclauses (2), (3) and (6), the Minister may

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consider any flood scenario that is appropriate to the flood work that is proposed and its location on the floodplain.

## Part 9      Mandatory conditions

### Notes.

- 1      Part 10 of this Plan allows for amendments to be made to this Part.
- 2      This Part is made in accordance with section 17 (c) of the Act.

### 48      General

- (1)    In this Part, a requirement to notify the Minister in writing will be satisfied by making a notification in writing to one of the addresses listed in Appendix 3 of this Plan or to the email address for the Department's Advisory Service, Water Regulation.

**Note.** At the commencement of this Plan, the email address for the Department's Advisory Service, Water Regulation is [water.enquiries@dpi.nsw.gov.au](mailto:water.enquiries@dpi.nsw.gov.au).

- (2)    Flood work approvals for flood works within the area shown on the Plan Map must have mandatory conditions where required to give effect to the following:
  - (a)    the rules for granting or amending flood work approvals in Part 8,
  - (b)    the approval holder must notify the Minister, in writing, immediately upon becoming aware of a breach of any condition of the approval,
  - (c)    the approval holder must, within two months of completion of the construction of the flood work, or within two months after the issue of the flood work approval if the approval is for the amendment of an existing flood work, submit the details of the flood work to the Minister in a form approved by the Minister,
  - (d)    if the approval holder intends to permanently cease using a flood work, the following requirements apply:
    - (i)    the approval holder must notify the Minister, in writing, that the approval holder intends to decommission the work and provide the Minister with a work plan for decommissioning the work at least ninety days before commencing action to decommission the work,
    - (ii)   the approval holder must not commence decommissioning the work unless the approval holder receives written notice from the Minister authorising the decommissioning of the work,
    - (iii) if the approval holder receives written notice from the Minister that does not authorise the work to be decommissioned, or that requires the work to be decommissioned according to specific requirements, the approval holder must act in accordance with the requirements in the notice,

- (iv) within sixty days of the completion of flood work decommissioning, the approval holder must notify the Minister, in writing, that the flood work has been decommissioned and provide details of the decommissioning,
- (d) the requirements of any action plan made as part of this Plan,
- (e) any other condition required to implement the provisions of this Plan.

## Part 10 Amendment of this Plan

### 49 General

- (1) Amendments specified throughout this Plan and in this Part are amendments authorised by this Plan.
- (2) An amendment authorised by this Plan is taken to include any consequential amendments required to be made to this Plan to give effect to that particular amendment.

**Note.** For example, if Part 1 is modified, this may require amendments to other parts of this Plan to include rules for that management zone.

### 50 Part 1

Part 1 may be amended to do any of the following:

- (a) modify the area to which this Plan applies,
- (b) modify the Plan Map,
- (c) modify a management zone using any of the following information, or other supporting information as determined by the Minister:
  - (i) an aerial photograph or equivalent satellite image showing flood inundation at the property scale of either the small design flood or the large design flood,
  - (ii) oblique photos showing flood inundation of either the small design flood or the large design flood that contain verifiable land marks,
  - (iii) oblique photos of flood survey marks that can be verified for either the small design flood or the large design flood.

**Note.** A hydraulic study which provides velocity and depth information for the large design flood may be used to support this information.

### 51 Part 3

Part 3 may be amended to do any of the following:

- (a) modify the description of the natural flooding regime,
- (b) modify the description of the existing flooding regime.

### 52 Part 4

Part 4 may be amended to do any of the following:

- (a) add, remove or modify the design floods used to establish the floodway network,
- (b) modify the Floodway Network Map.

### **53 Part 5**

Part 5 may be amended to do any of the following:

- (a) modify the ecological benefits of flooding specified in clause 18,
- (b) add, remove or modify ecological assets in clause 19,
- (c) add, remove or modify Aboriginal values in clause 21,
- (d) add, remove or modify heritage sites in clause 22.

### **54 Part 6**

Part 6 may be amended to do any of the following:

- (a) add, remove or modify the types of flood works in clause 24,
- (b) add, remove or modify the number or types of flood works in clause 25,
- (c) modify the area enclosed by existing flood works in clause 26.

### **55 Part 8**

Part 8 may be amended to do any of the following:

- (a) add, remove or modify rules for granting or amending flood work approvals,
- (b) add rules to give effect to an action plan made under Part 8 including rules for:
  - (i) the granting or amending of flood work approvals, and
  - (ii) the modification or removal of existing flood works,
- (c) add rules for the removal or modification of existing flood works.

### **56 Part 9**

Part 9 may be amended to do any of the following:

- (a) add, remove or modify requirements for the decommissioning of works,
- (b) add, remove or modify conditions to implement an action plan made as part of this Plan,
- (c) add, remove or modify requirements if the approval holder intends to permanently cease using a flood work.

## **57 Dictionary**

The Dictionary may be amended to add, modify or remove a definition.

## **58 Schedules**

- (1) Schedule 1 may be amended to add or remove any ecological assets or ecological values that benefit from flooding.
- (2) Schedule 2 may be amended to add or remove areas of ecological and cultural significance in the Barwon-Darling Management Zone D.

## Dictionary

**Note.** Unless otherwise defined in this Plan, words and expressions that are defined in the Act or in the regulations made under the Act have the same meaning in this Plan.

**Aboriginal values** are sites, objects, landscapes, resources and beliefs that are important to Aboriginal people as part of their continuing culture.

**Aboriginal value enhancement work** is a flood work that is constructed only to benefit Aboriginal value assets that are listed in the Aboriginal Heritage Information Management System, Aboriginal Water Initiative System, Murray Darling Basin Authority Aboriginal Submissions Database, NSW State Heritage Register, Commonwealth Heritage Register or any other source and/or database deemed relevant by the Minister.

**Annual Exceedance Probability** is the chance of a flood of a given or larger size occurring in any one 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 same size or larger will occur in any one year.

**borrow** is an area of land where material is excavated or removed to construct a flood work at another location. The removal of material from this area results in a depression or hole in the ground.

**connectivity** refers to the unimpeded passage of floodwater through the floodplain. Connectivity is important for in-stream aquatic processes and biota and the conservation of natural riverine systems.

**cultural asset** is an object, place or value that is important for people to maintain their connection, beliefs, customs, behaviours and social interaction.

**depth-velocity product** is a hydraulic model output that can be used to indicate areas of a floodplain where a significant discharge of water occurs during floods; that is, areas where flow velocity and/or water depth are relatively high.

**design flood** is a flood of known magnitude or annual exceedance probability that can be modelled. A design flood is selected to design floodway networks which are used to define management zones for the planning and assessment of the management of flood works on floodplains. The selection 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.

**discharge (or flow)** is the rate of flow measured in volume per unit of time (e.g. megalitres per day = ML/day).

**ecological assets** are wetlands or other floodplain ecosystems, including watercourses that depend on flooding to maintain their ecological character. Areas where groundwater reserves are recharged by floodwaters are also considered to be ecological assets. Ecological assets are spatially explicit and are set in the floodplain landscape.

**ecological enhancement work** is a flood work that is constructed only to benefit ecological assets that are recognised in or protected by a local, state or Commonwealth environmental policy and/or legislation.

**ecological values** are surrogates for biodiversity that are used to prioritize the ecological assets and include fauna species and fauna habitat, vegetation communities and areas of conservation significance.

**Exceedances per Year (EY)** is the expected number of times in a year that the event will occur or be exceeded.

**existing development conditions** refers to the level of development at the commencement of

this Plan.

***fish passage*** refers to connectivity that facilitates the movement of native fish species between upstream and downstream habitats (longitudinal connectivity) and adjacent riparian and floodplain areas (lateral connectivity). Areas that are important for fish passage include rivers, creeks and flood flow paths.

***Flood Risk Management Plan (FRMP)*** identifies and determines options in consideration of social, ecological and economic factors relating to flood risk and the management of flood prone land.

***Flood Risk Management Study (FRMS)*** provides preferred options relating to flood risk and provides the information necessary for adequate forward planning of flood prone land.

***flood study (FS)*** is a comprehensive technical investigation of flood behaviour and defines the nature of flood risk.

***flood-dependent assets*** refers to assets that have been identified in this Plan as having important ecological or cultural features which rely on inundation by floodwaters to sustain essential processes.

***flooding regime*** refers to the frequency, duration, nature and extent of flooding.

***floodplain watercourses*** include:

- (a) permanent flowing rivers and creeks, including those where the flow is modified by upstream dam(s), and
- (b) intermittent flowing rivers and creeks that retain water in a series of disconnected pools after flow ceases including those where the flow is modified by upstream dam(s), to the top of the natural bank regardless of whether the channel has been physically modified, and
- (c) flood channels or flood runners that run across or along floodplains during high flow events.

***floodways*** are areas where a significant discharge of floodwater occurs during small and large design floods.

***groundwater recharge areas*** are areas where water from a flood event leaks through the soil profile into the underlying aquifers.

***heritage site enhancement work*** is a flood work that is constructed only to benefit heritage site assets that are listed in the Aboriginal Heritage Information Management System, Aboriginal Water Initiative System, Murray Darling Basin Authority Aboriginal Submissions Database, NSW State Heritage Register, NSW State Heritage Inventory, Historic Heritage Information Management Systems, Commonwealth Heritage Register or any other source and/or database deemed relevant by the Minister.

***heritage sites*** are cultural heritage objects and places as listed on Commonwealth, State and local government heritage registers or any other source and/or database deemed relevant by the Minister.

***high value infrastructure*** includes but is not limited to houses/dwellings, infrastructure protection works, town levees, stockyards, sheds and pump sites. It does not include farm levee banks, irrigation development and fences.

***infrastructure protection work*** refers to a flood work that is for the protection of houses, stock yards and other major infrastructure, such as machinery sheds.

***management zones*** are areas in the floodplain that have specific rules to define the purpose, nature and construction of flood works that can occur in those areas.

***natural flooding regime*** refers to how flood waters moved over the floodplain before development (i.e. flood works and major storage dams), landuse changes and climate change.

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***natural surface level*** is the average undisturbed surface level in the immediate vicinity of a flood work.

***primary access road*** is a road providing access from a public road to a permanently occupied fixed dwelling via a direct route.

***pre-development conditions*** refers to the natural flooding regimes.

***windrow*** refers to a row or line of cut vegetation or other material.

## **Schedule 1      Ecological assets and ecological values**

### **1      Ecological assets identified for the purposes of this Plan:**

- (1) wetlands:
  - (a) semi-permanent (non-woody):
    - (i) common reed (*Phragmites australis*),
    - (ii) cumbungi (*Typha domingensis*),
    - (iii) tussock rush (*Juncus aridicola*),
    - (iv) ribbed spikerush (*Eleocharis plana*), and
    - (v) water couch (*Paspalum distichum*),
  - (b) floodplain (flood-dependent shrubland):
    - (i) canegrass (*Eragrostis australasica*),
    - (ii) eurah (*Eremophila bignoniiflora*),
    - (iii) golden goosefoot (*Chenopodium auricomum*),
    - (iv) lignum (*Duma florulenta*),
    - (v) nitre goosefoot (*Chenopodium nitrariaceum*), and
    - (vi) river cooba (*Acacia stenophylla*).
- (2) other floodplain ecosystems:
  - (a) flood-dependent forest/woodland: river red gum (*Eucalyptus camaldulensis*),
  - (b) flood-dependent woodland:
    - (i) coolibah (*Eucalyptus coolabah*), and
    - (ii) black box (*Eucalyptus largiflorens*),
  - (c) floodplain watercourses:
    - (i) drainage lines,
    - (ii) lagoons,
    - (iii) billabongs,
    - (iv) waterholes, and
    - (v) lakes.

(3) areas of groundwater recharge:

- (a) alluvial soils, and
- (b) rivers and watercourses.

**Note.** The nature of groundwater recharge is complex and recharge may occur in areas other than those listed.

## **2 Ecological values identified for the purposes of this Plan:**

(1) areas of state and national conservation significance that are dependent on flooding:

- (a) Barwon Nature Reserve,
- (b) Barwon State Conservation Area,
- (c) Gundabooka National Park,
- (d) Gundabooka State Conservation Area,
- (e) Toorale National Park, and
- (f) Toorale State Conservation Area.

(2) habitat for flood-dependent fauna:

- (a) mapped flood-dependent vegetation communities:
  - (i) semi-permanent wetland (common reed),
  - (ii) semi-permanent wetland (cumbungi),
  - (iii) semi-permanent wetland (tussock rush),
  - (iv) semi-permanent wetland (ribbed spikerush),
  - (v) semi-permanent wetland (water couch),
  - (vi) floodplain (flood-dependent shrubland) wetland (canegrass),
  - (vii) floodplain (flood-dependent shrubland) wetland (eurah),
  - (viii) floodplain (flood-dependent shrubland) wetland (golden goosefoot),
  - (ix) floodplain (flood-dependent shrubland) wetland (lignum),
  - (x) floodplain (flood-dependent shrubland) wetland (nitre goosefoot),
  - (xi) floodplain (flood-dependent shrubland) wetland (river cooba),
  - (xii) flood-dependent forest/woodland (wetlands) (river red gum),
  - (xiii) flood-dependent woodland (coolibah), and

- (xiv) flood-dependent woodland (black box),
- (b) drought refuges, and
- (c) observed waterbird breeding habitat sites.
- (3) fauna species, including threatened species:
  - (a) observed fish records:
    - (i) catfish (*Tandanus tandanus*),
    - (ii) silver perch (*Bidyanus bidyanus*),
    - (iii) olive perchlet (*Ambassis agassizii*),
    - (iv) un-specked hardyhead (*Craterocephalus stercusmuscarum fulvus*),
    - (v) unidentified carp-gudgeon (*Hypseleotris spp*),
    - (vi) spangled perch (*Leiopotherapon unicolor*),
    - (vii) Murray cod (*Maccullochella peelii*),
    - (viii) golden perch (*Macquaria ambigua*),
    - (ix) Murray-Darling rainbowfish (*Melanotaenia fluviatilis*),
    - (x) bony herring (*Nematalosa erebi*),
    - (xi) Australian smelt (*Retropinna semoni*), and
    - (xii) hyrtl's tandan (*Neosilurus hyrtl*),
  - (b) observed frog records:
    - (i) desert froglet (*Crinia deserticola*),
    - (ii) eastern sign-bearing froglet (*Crinia parinsignifera*),
    - (iii) common eastern froglet (*Crinia signifera*),
    - (iv) sloane's froglet (*Crinia sloanei*),
    - (v) striped burrowing frog (*Cyclorana alboguttata*),
    - (vi) short-footed frog (*Cyclorana brevipes*),
    - (vii) wide-mouthed frog (*Cyclorana novaehollandiae*),
    - (viii) water-holding frog (*Cyclorana platycephala*),
    - (ix) rough frog (*Cyclorana verrucosa*),

- (x) fletcher's frog (*Limnodynastes fletcheri*),
- (xi) salmon-striped frog (*Limnodynastes salmini*),
- (xii) spotted marsh frog (*Limnodynastes tasmaniensis*),
- (xiii) green tree frog (*Litoria caerulea*),
- (xiv) broad-palmed frog (*Litoria latopalmata*),
- (xv) peron's tree frog (*Litoria peronii*),
- (xvi) desert tree frog (*Litoria rubella*),
- (xvii) sudell's frog (*Neobatrachus sudellae*),
- (xviii) crucifix frog (*Notaden bennettii*),
- (xix) ornate burrowing frog (*Platyplectrum ornatum*), and
- (xx) wrinkled toadlet (*Uperoleia rugosa*),
- (c) observed amphibious mammal records:
  - (i) water rat (*Hydromys chrysogaster*),
- (d) observed turtle and fauna records:
  - (i) eastern long-necked turtle (*Chelodina longicollis*),
  - (ii) broad shelled turtle (*Chelodina expansa*),
  - (iii) Murray turtle (*Emydura macquarii*),
  - (iv) eastern water skink (*Eulamprus quoyii*),
  - (v) red-bellied black snake (*Pseudechis porphyriacus*),
  - (vi) river snail (*Notopala sublineata*),
  - (vii) billabong banded snail (*Notopala kingi suprafasciata*),
  - (viii) sculptured snail (*Plotiopsis balonnensis*), and
  - (ix) pouch snail (*Glyptophysa gibbosa*).
- (e) observed threatened waterbird species records:
  - (i) Australian painted snipe (*Rostratula australis*),
  - (ii) black-necked stork (*Ephippiorhynchus asiaticus*),
  - (iii) brolga (*Grus rubicunda*),

- (iv) blue-billed duck (*Oxyura australis*), and
- (v) freckled duck (*Stictonetta naevosa*),
- (f) observed colonial nesting waterbird species records:
  - (i) Australasian darter (*Anhinga novaehollandiae*),
  - (ii) cattle egret (*Ardea ibis*),
  - (iii) intermediate egret (*Ardea intermedia*),
  - (iv) eastern great egret (*Ardea modesta*),
  - (v) white-necked heron (*Ardea pacifica*),
  - (vi) little egret (*Egretta garzetta*),
  - (vii) white-faced heron (*Egretta novaehollandiae*),
  - (viii) nankeen night-heron (*Nycticorax caledonicus*),
  - (ix) Australian pelican (*Pelecanus conspicillatus*),
  - (x) great cormorant (*Phalacrocorax carbo*),
  - (xi) little black cormorant (*Phalacrocorax sulcirostris*),
  - (xii) little pied cormorant (*Microcarbo melanoleucos*),
  - (xiii) pied cormorant (*Phalacrocorax varius*),
  - (xiv) Australian white ibis (*Threskiornis molucca*),
  - (xv) glossy ibis (*Plegadis falcinellus*),
  - (xvi) royal spoonbill (*Platalea regia*),
  - (xvii) straw-necked ibis (*Threskiornis spinicollis*), and
  - (xviii) yellow-billed spoonbill (*Platalea flavipes*).
- (g) modelled fish biodiversity:
  - (i) catfish (*Tandanus tandanus*),
  - (ii) olive perchlet (*Ambassis agassizii*),
  - (iii) purple spotted gudgeon (*Mogurnda adspersa*), and
  - (iv) silver perch (*Bidyanus bidyanus*).

**Note.** Commonwealth and State environmental watering priority areas are comprised of ecological assets and values. The following strategies and policies were considered:

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- *Commonwealth environmental water use options 2014-15: Northern Unregulated Rivers.* Commonwealth Environmental Water Office,
- *Assessment of environmental water requirements for the proposed Basin Plan: Barwon-Darling River upstream of Menindee Lakes 2012,* Murray-Darling Basin Authority,
- *Proposed arrangements for shepherding Commonwealth environmental water in NSW – Outcomes of consultation 2012,* NSW Department of Primary Industries, Office of Water, and
- *Basin Environmental Watering Outlook 2015-2016,* Murray-Darling Basin Authority.

## Schedule 2 Areas of ecological and cultural significance in the Barwon-Darling Management Zone D

Column 1	Column 2	Column 3	Column 4	Column 5
ID number	Area of ecological and/or cultural significance	Zone	Easting	Northing
1	Brewarrina Fish Traps	55	486013	6685860
2	Briery Anabranh	55	533823	6665290
3	Briery Water	55	522808	6670460
4	Broadsheet Lagoon on Wombat Creek	55	561584	6663570
5	Bundabina Falls			
6	Butti Lagoon	55	665700	6742260
7	Canary Lagoon	55	576526	6675920
8	Cemetery Billabong			
9	Collymongle Lagoon	55	667408	6742760
10	Comilaroy Billabong 1			
11	Duck Egg Swamp	55	375896	6647940
12	Eight Mile Lagoon	55	389888	6666120
13	Elephant Waterhole	55	550712	6661140
14	Euromlin Lagoon	55	596958	6673250
15	Eurool Wetland			
16	First Lagoon	55	666292	6740750
17	Fish Holes Lagoons	55	636001	6712220
18	Gidgin Lagoon	55	590041	6672120
19	Gil Gil Creek Waterhole			
20	Half Moon Lagoon	55	593343	6672720
21	Herding Yard Lagoon	55	577733	6677530
22	Horseshoe Lagoon A	55	422284	6689030
23	Horseshoe Lagoon B	55	543506	6667940
24	Kier Lagoon	55	559370	6671820
25	Louth Waterhole	55	305872	6618820
26	Meeki Creek Billabong			
27	Ngemba Old Mission Billabong	55	495326	6684170
28	Orange Tree Lagoon	55	375524	6656050



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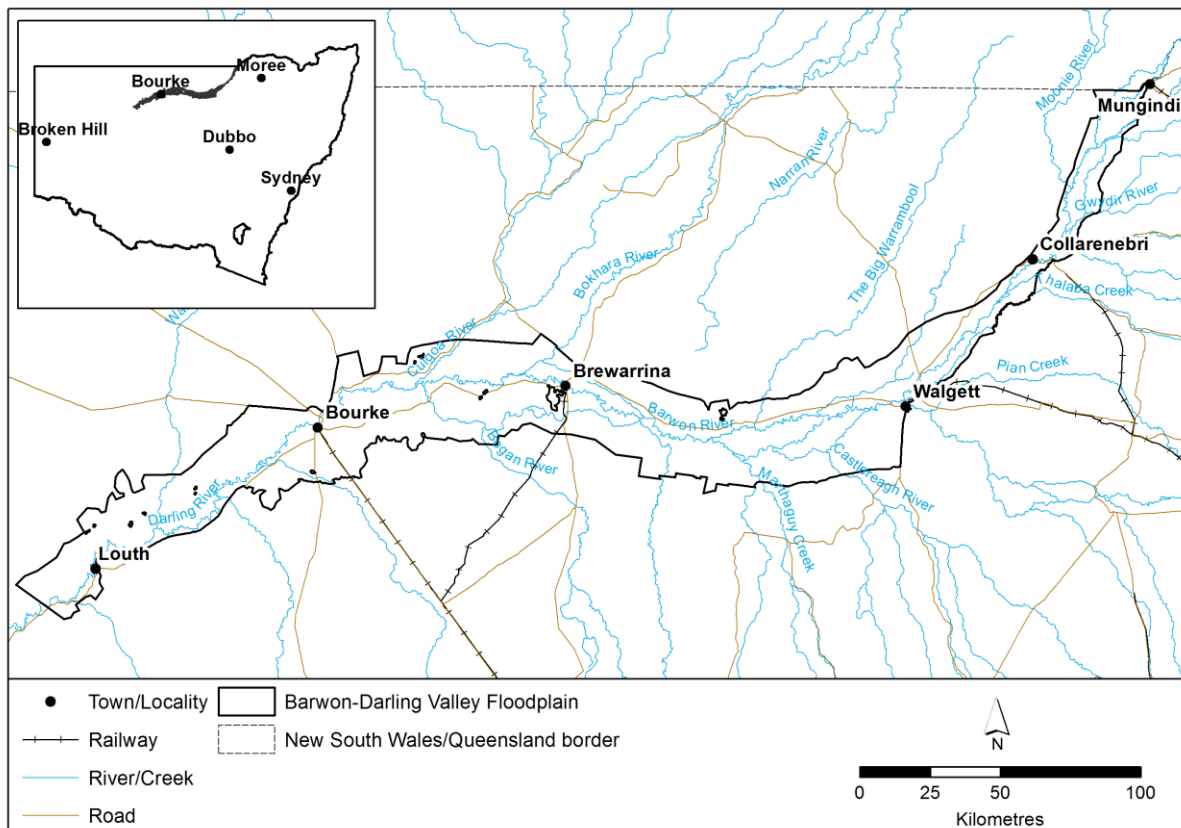
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017

29	Piano Creek Lagoon (A)	55	442551	6686280
30	Piano Creek Lagoon (B)	55	440301	6686210
31	Polygonum Swamp	55	399396	6673540
32	Ross Billabong	55	351067	6640280
33	Ryan's Lagoon on Mulga Creek	55	379939	6657040
34	Second Lagoon	55	665914	6741190
35	Sparkes Warrambool	55	620135	6703510
36	Talowla Billabong	55	333095	6631670
37	The Big Billabong	55	396767	6673540
38	Toothia Billabong	55	571449	6676000
39	Turee Lake	55	412835	6685530
40	Two (2) Mile Creek Lagoon			
41	Ulah Lagoon	55	581514	6675360
42	Unnamed lagoon 1	55	669953	6751040
43	Unnamed lagoon 2	55	666131	6754390
44	Unnamed lagoon 3	55	640027	6712910
45	Unnamed lagoon 4	55	665203	6742800
46	Unnamed lagoon 5	55	665967	6750470
47	Unnamed lagoon 6	55	643457	6715820
48	Unnamed lagoon 7	55	672345	6767220
49	Unnamed lagoon 8	55	671544	6765900
50	Unnamed lagoon 9	55	643340	6717560
51	Walgett Lagoon	55	605554	6678620
52	Wali Billabong			
53	Warraweena Lagoon	55	423935	6687260
54	Waterholes along Big Waterhole Creek	55	648890	6721060
55	Werrabilla Lagoon	55	661149	6736620
56	Wilgelroy Lagoon	55	600812	6673090
57	Yambacuna Lagoon	55	462212	6685350
58	Yambie Swamp and Lagoon	55	531576	6671540

**Note.** Coordinates were calculated using GDA 1994 MGA Zone 55. Coordinates are not provided for some cultural assets due to data sensitivity.

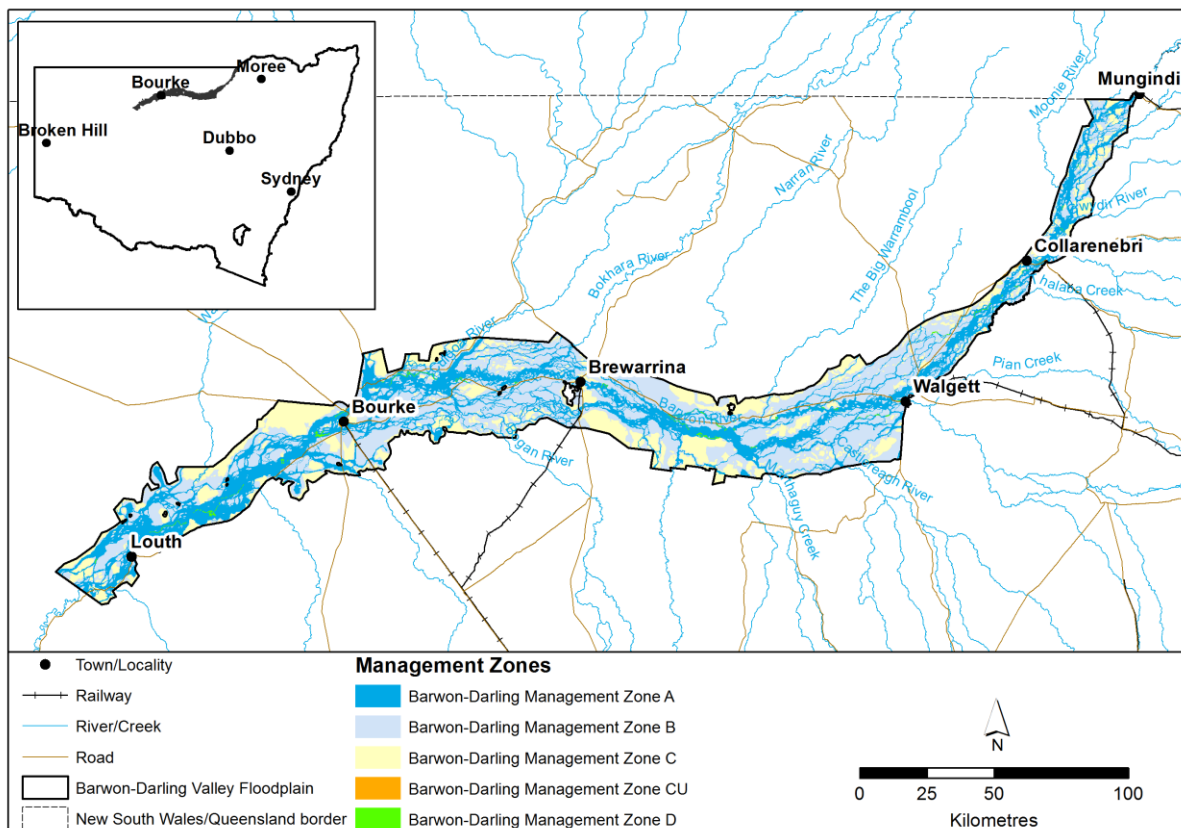
## Appendix 1 Overview of the Plan Map

### Overview of the Floodplain Management Plan Map (FMP015\_Version 1), Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017

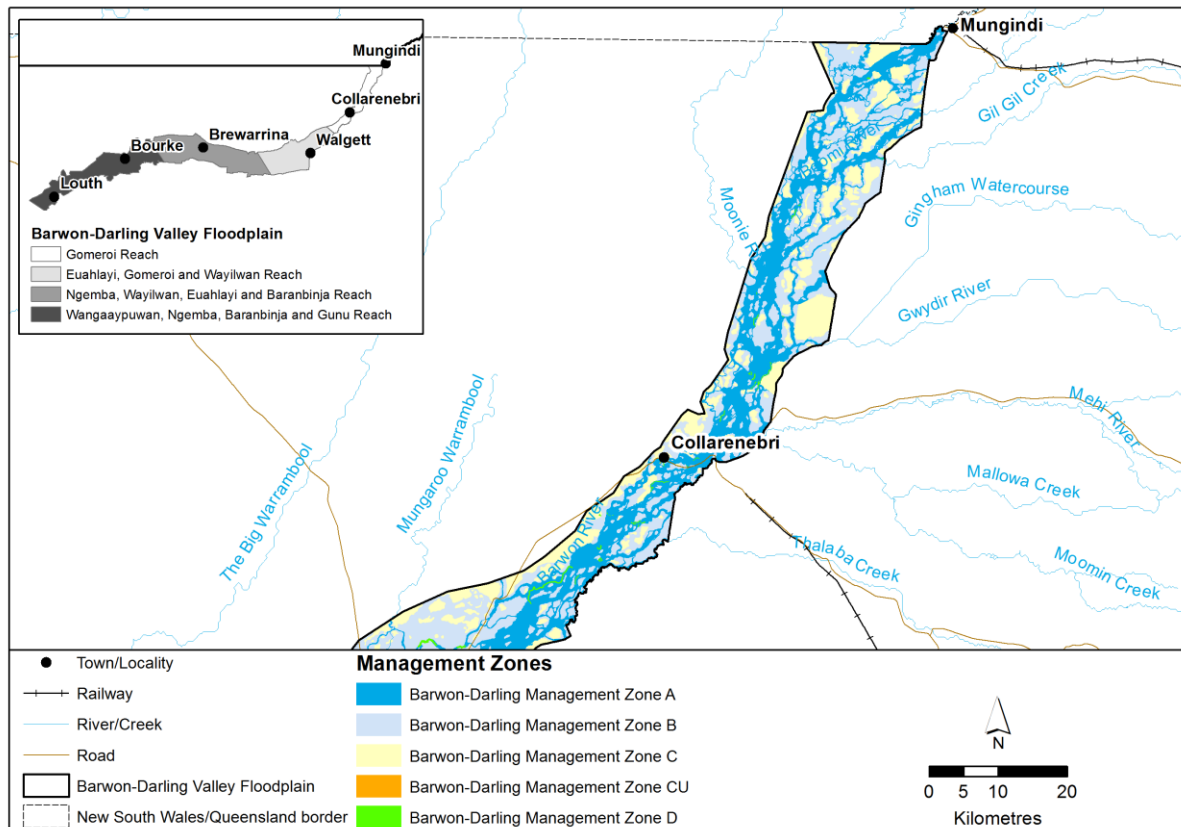


## Appendix 2 Overview of the Management Zones Map

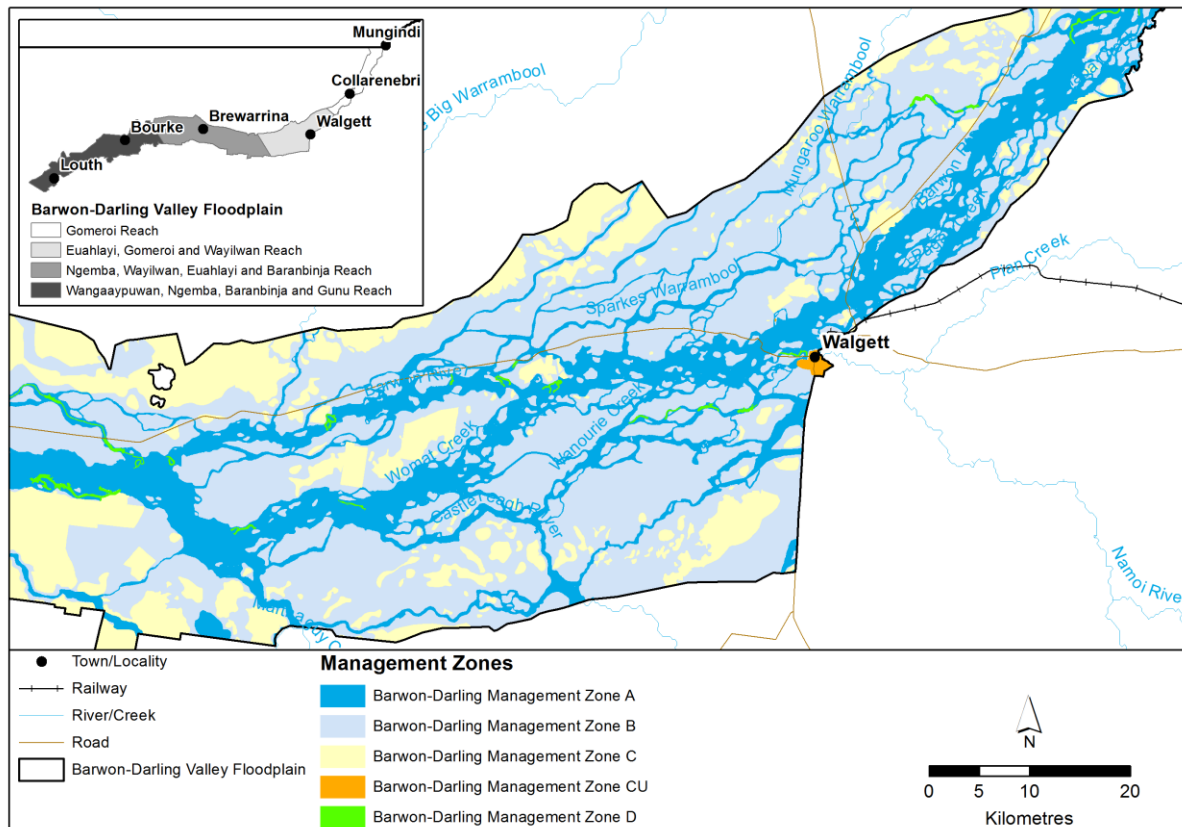
### Overview of the Management Zones Map (FMP016\_Version 1), Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017



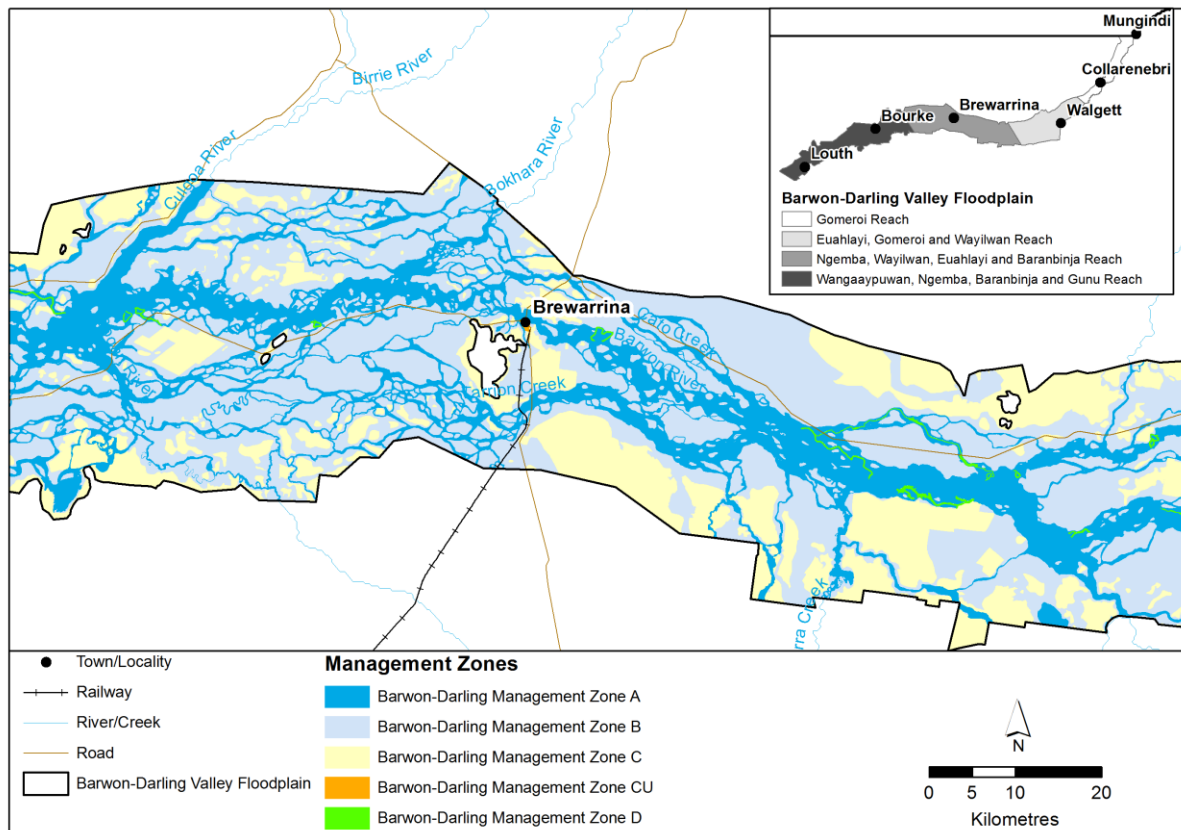
**Gomeri Reach of the Management Zones Map (FMP016\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



**Euahlayi, Gomeri and Wayilwan Reach of the Management Zones Map (FMP016\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**

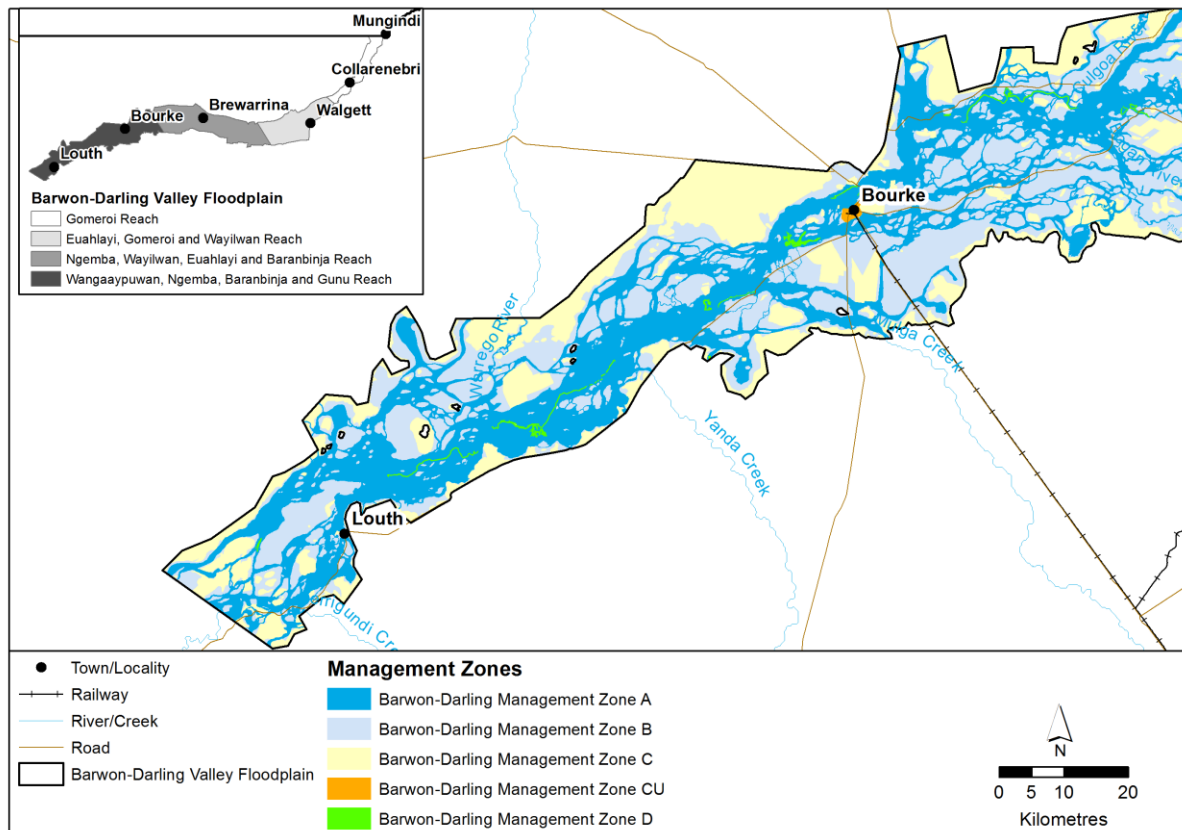


**Ngemba, Wayilwan, Euahlayi and Baranbinja Reach of the Management Zones Map  
(FMP016\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



**Wangaaypuwan, Ngemba, Baranbinja and Gunu Reach of the Management Zones Map  
(FMP016\_Version 1),**

**Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



### **Appendix 3     Inspection of maps and notifications**

Copies of the Plan Map, the Management Zones Map, Floodway Network Map, the Ecological Assets Map, the Existing Flood Works Map and the Peak Flood Flow Distribution (1976) Map may be inspected at the offices listed below. Any notifications that may be required to be made to the Minister, as specified in this Plan can be made to either of the offices listed below.

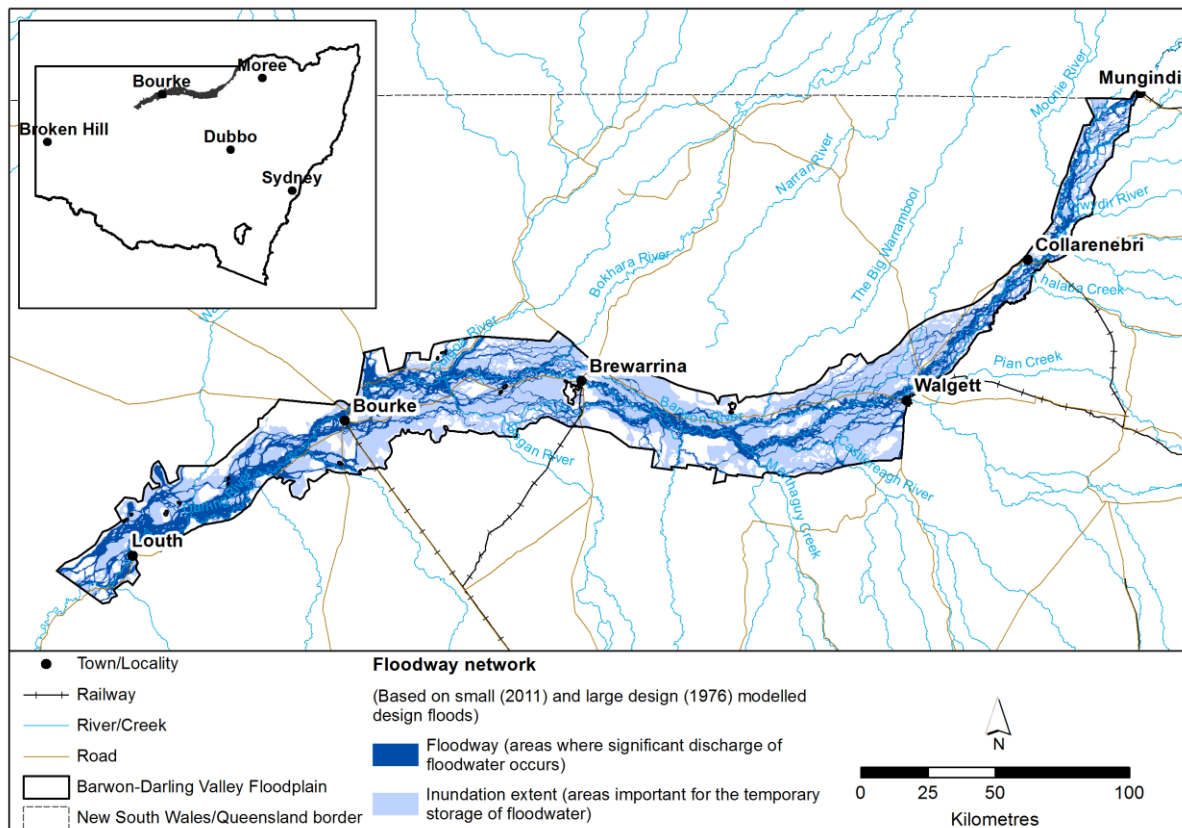
DPI Water  
NSW Department of Primary Industries  
209 Cobra Street  
DUBBO NSW 2830

DPI Water  
NSW Department of Primary Industries  
Tamworth Agricultural Institute  
4 Marsden Park Road  
CALALA NSW 2340

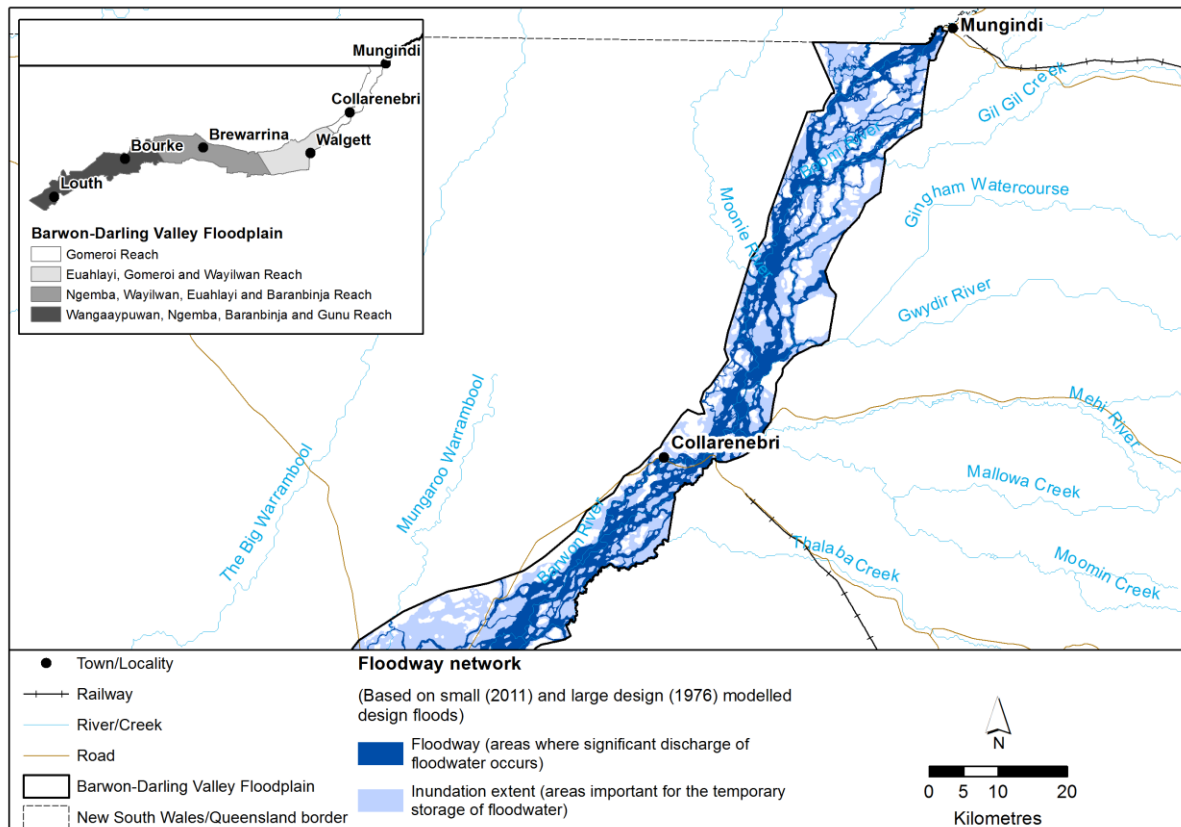


## Appendix 4 Overview of the Floodway Network Map

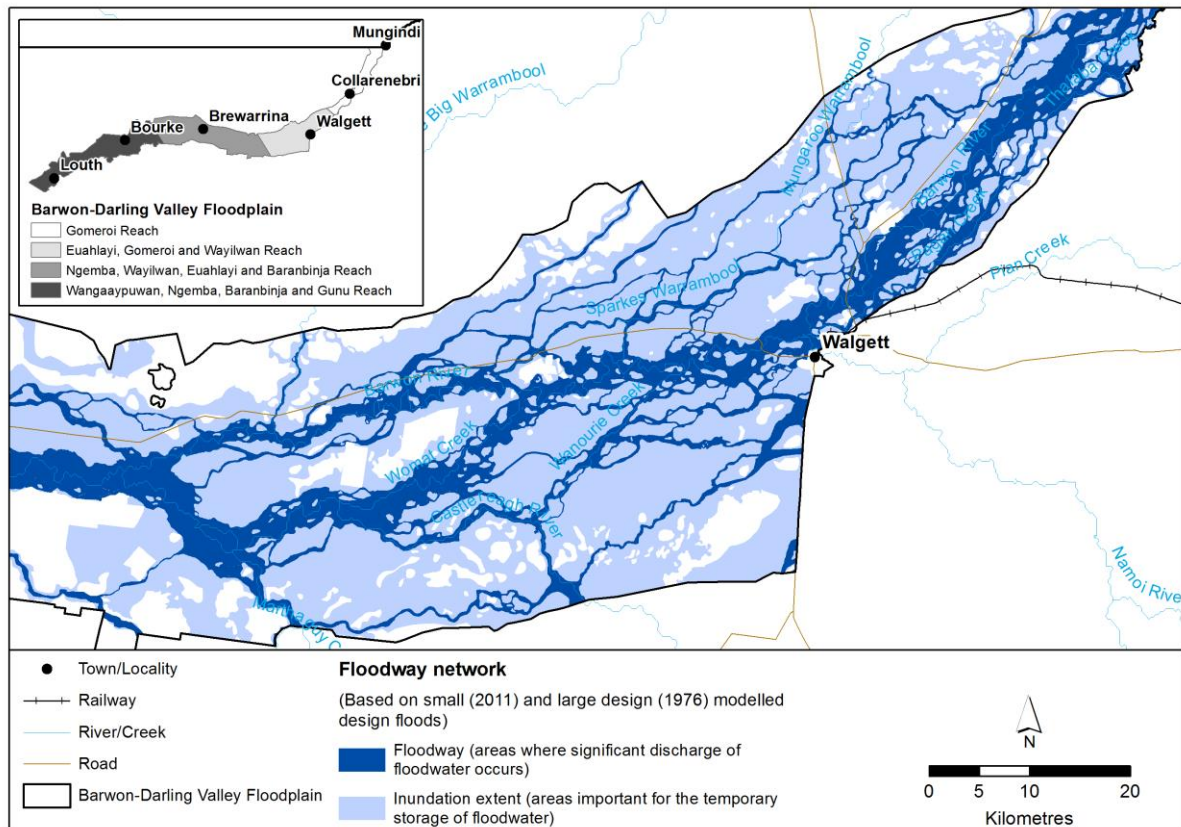
### Overview of the Floodway Network Map (FMP017\_Version 1), Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017



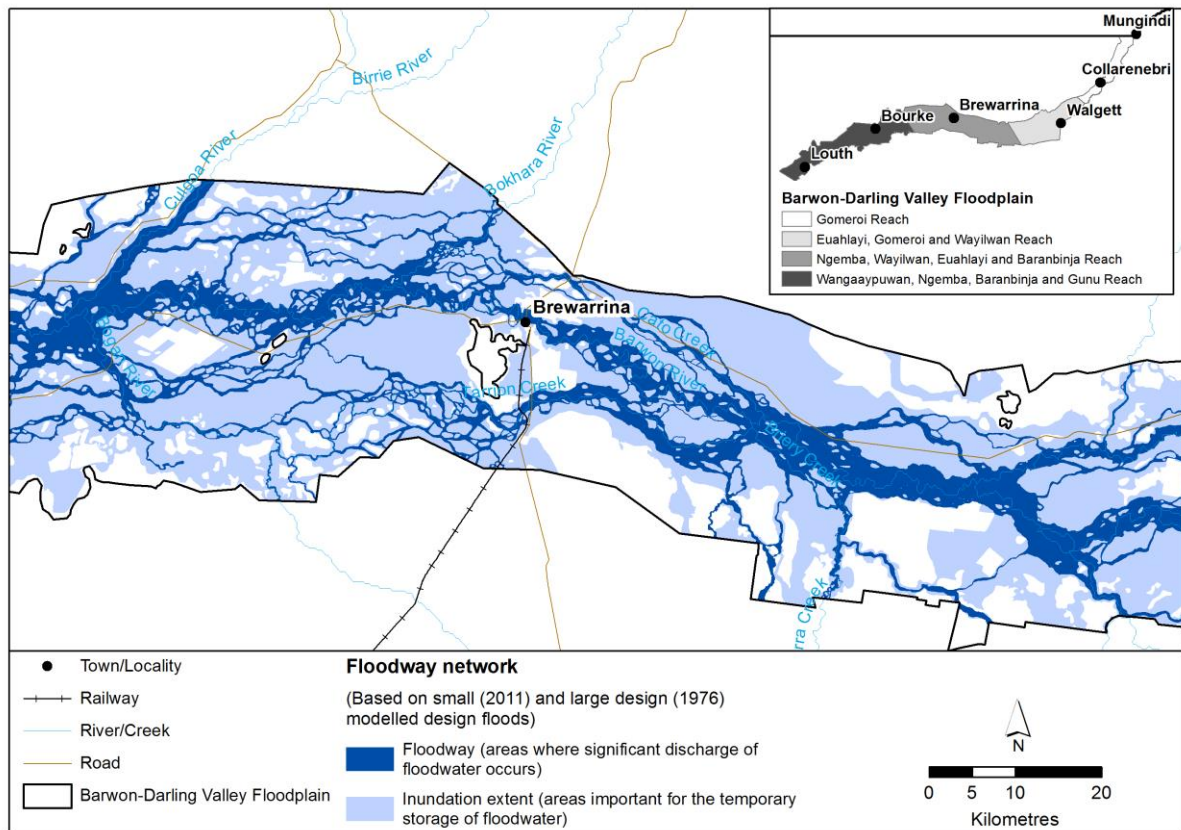
Published LW 30 June 2017 (2017 No 328)



Published LW 30 June 2017 (2017 No 328)

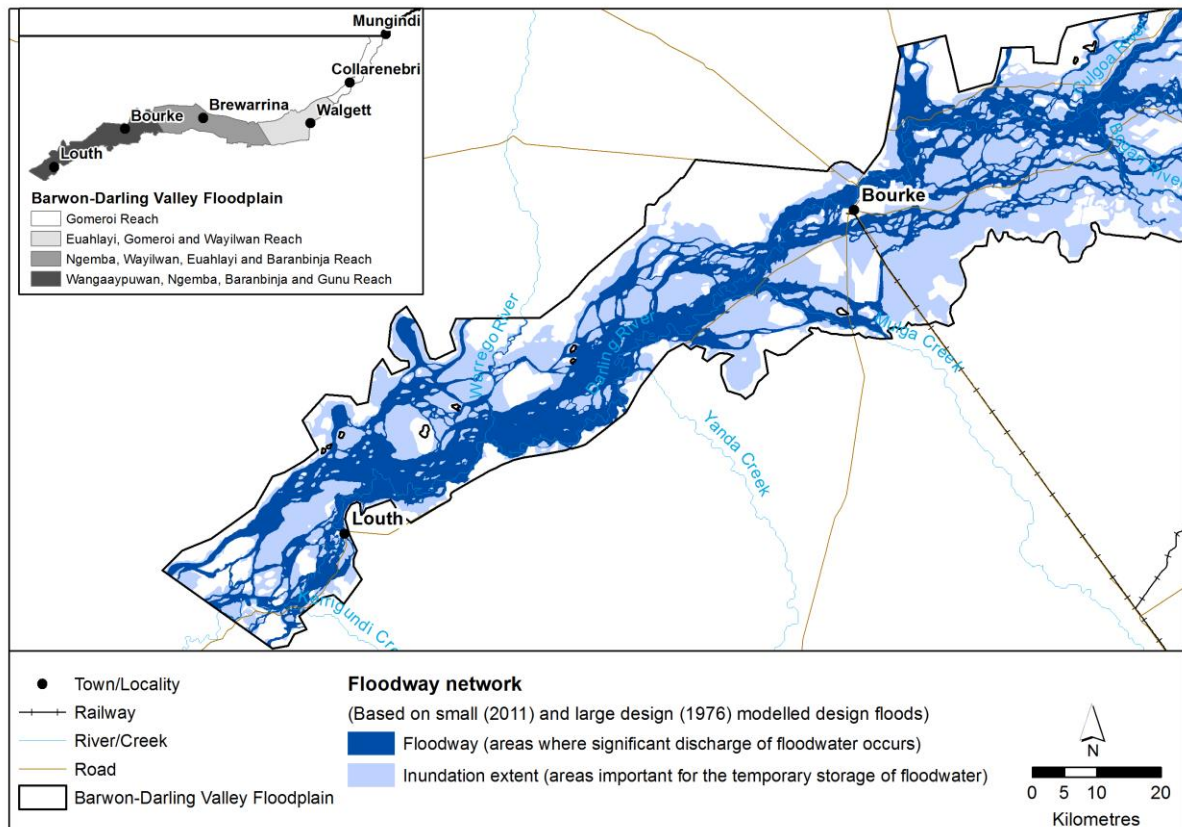


**Ngemba, Wayilwan, Euahlayi and Baranbinja Reach of the Floodway Network Map  
(FMP017\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



**Wangaaypuwan, Ngemba, Baranbinja and Gunu Reach of the Floodway Network Map  
(FMP017\_Version 1),**

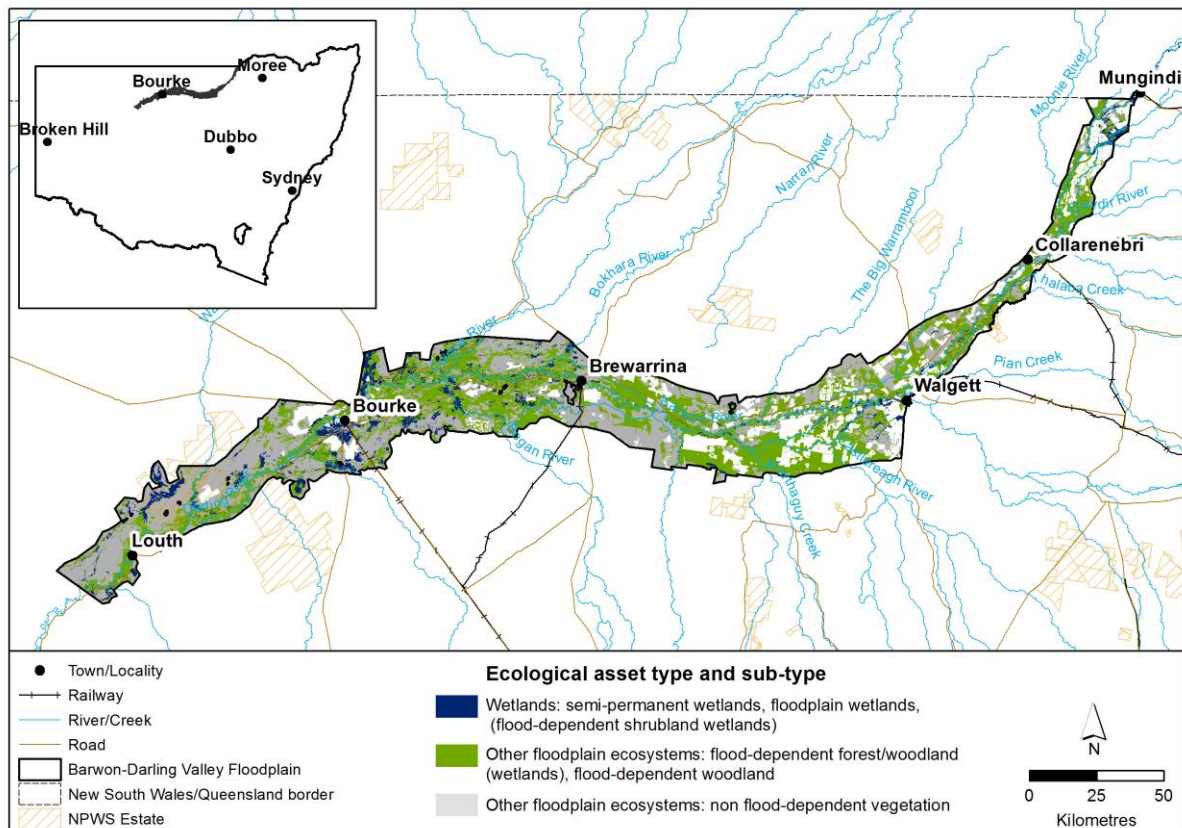
**Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



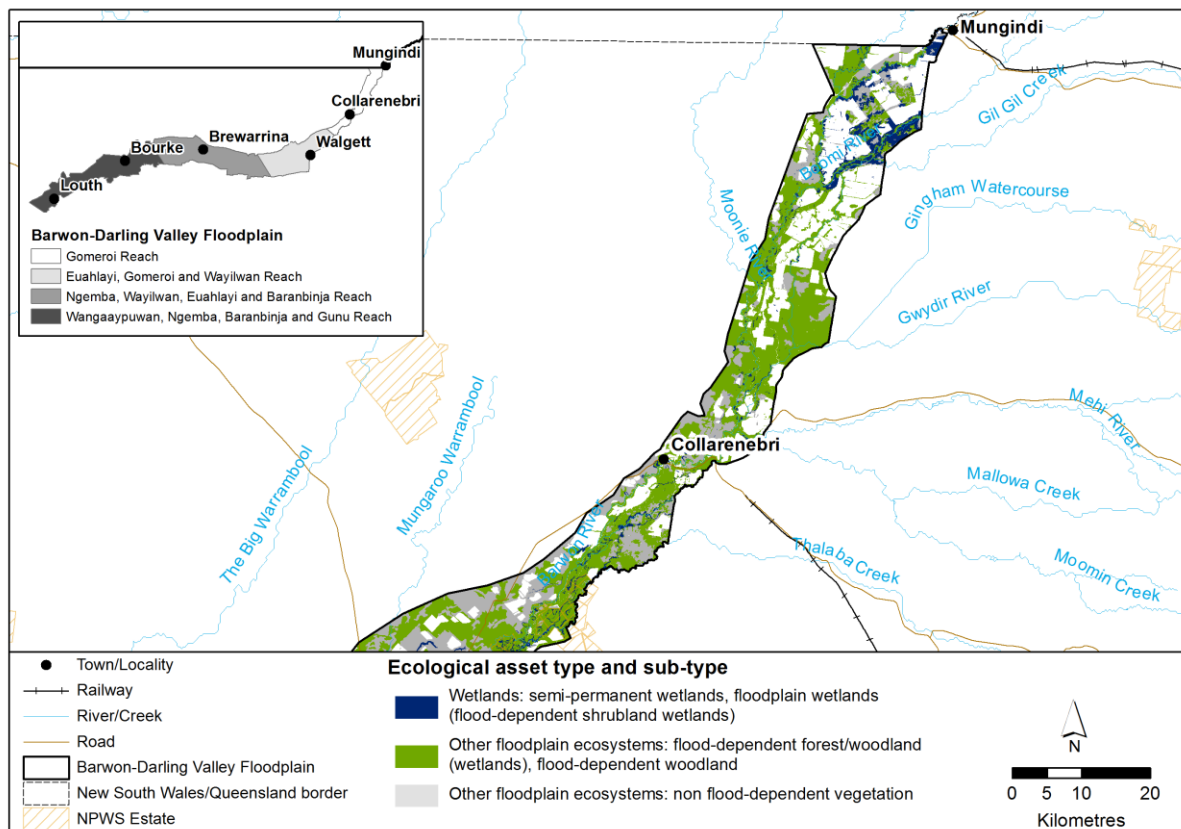


## Appendix 5 Overview of the Ecological Assets Map

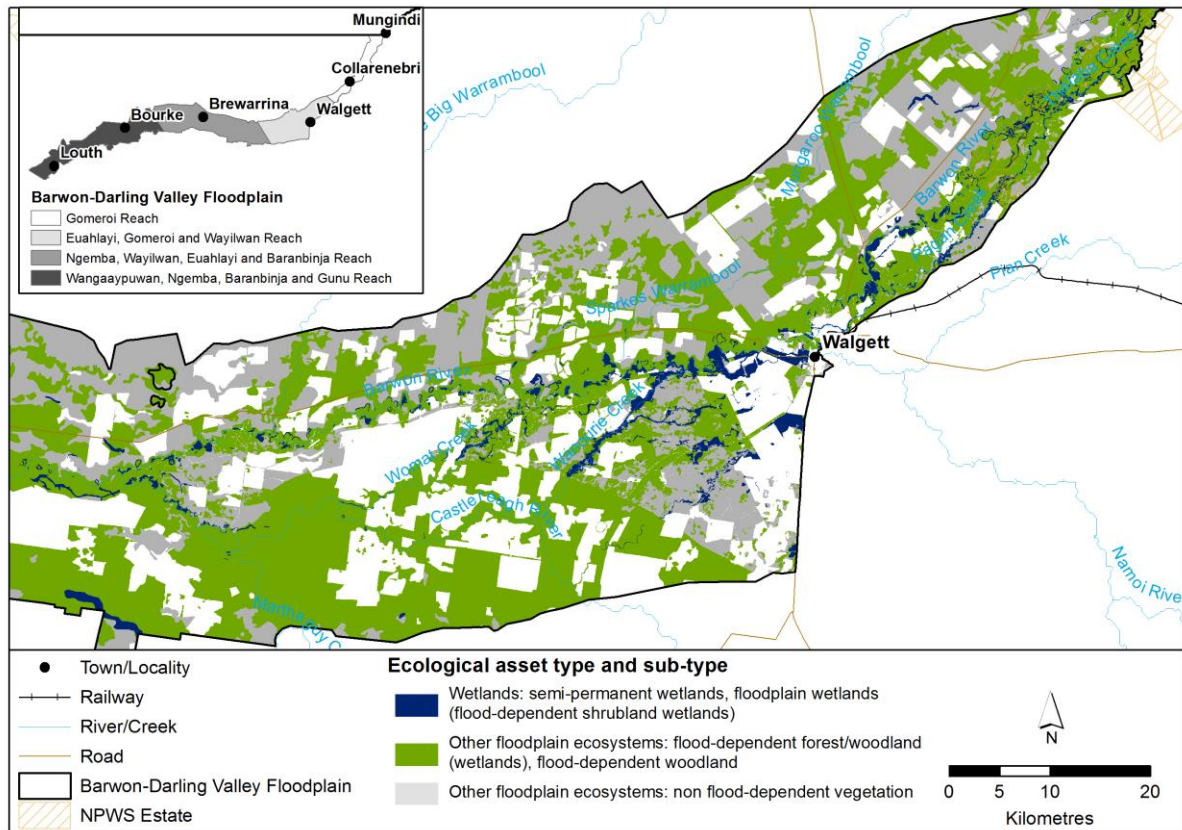
### Overview of the Ecological Assets Map (FMP018\_Version 1), Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017



Published LW 30 June 2017 (2017 No 328)

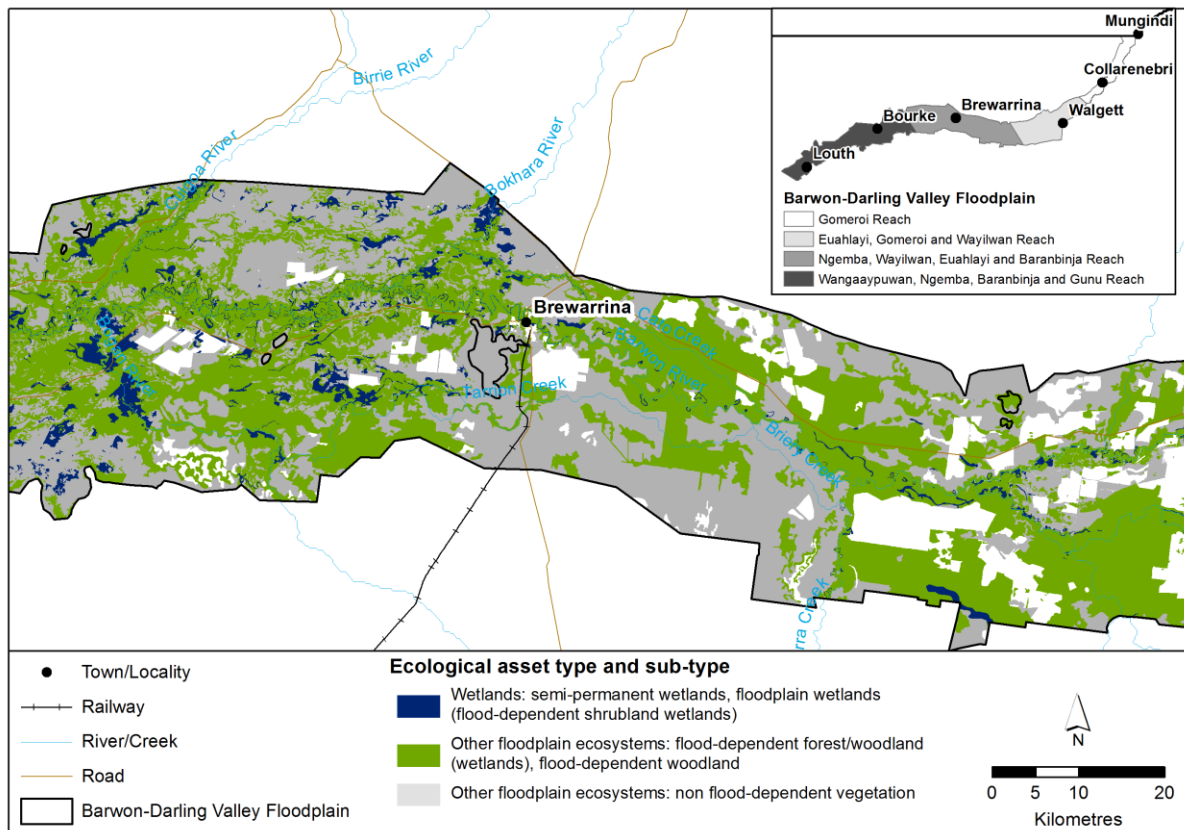


**Euahlayi, Gomeri and Wayilwan Reach of the Ecological Assets Map (FMP018\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



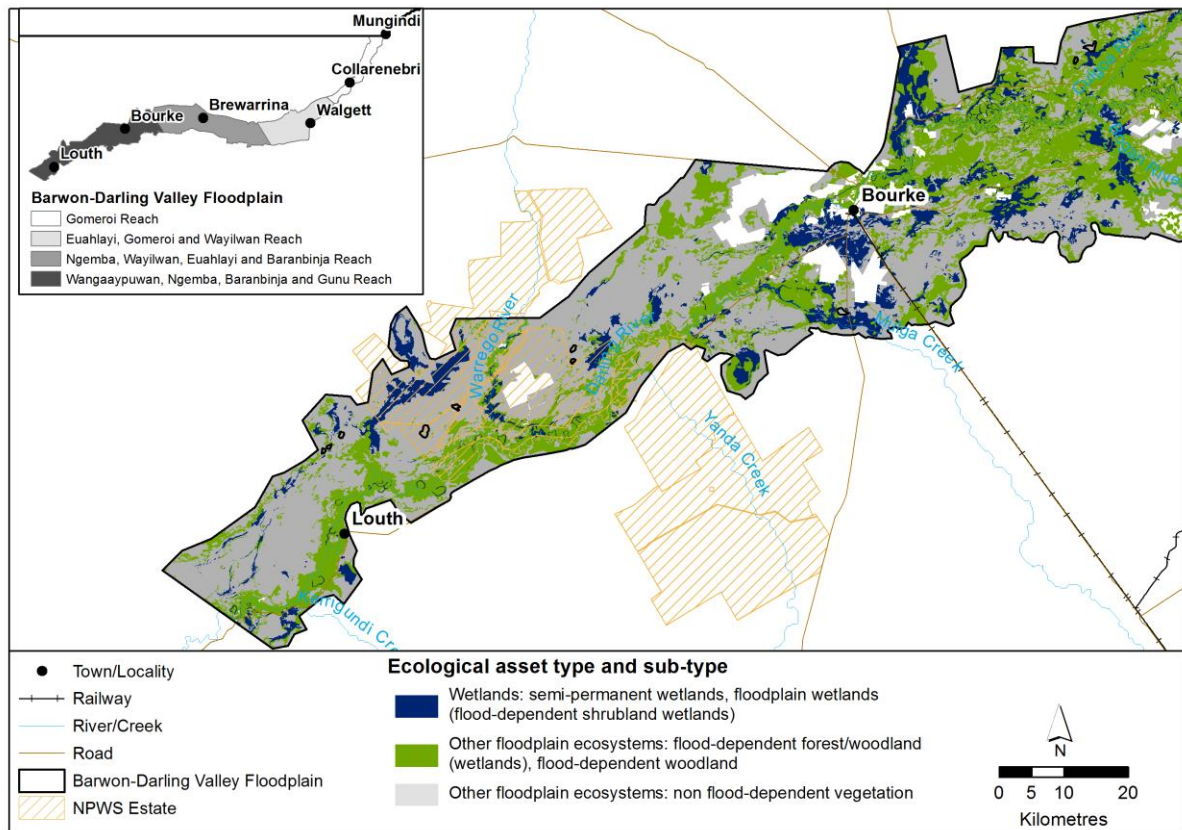


**Ngemba, Wayilwan, Euahlayi and Baranbinja Reach of the Ecological Assets Map  
(FMP018\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



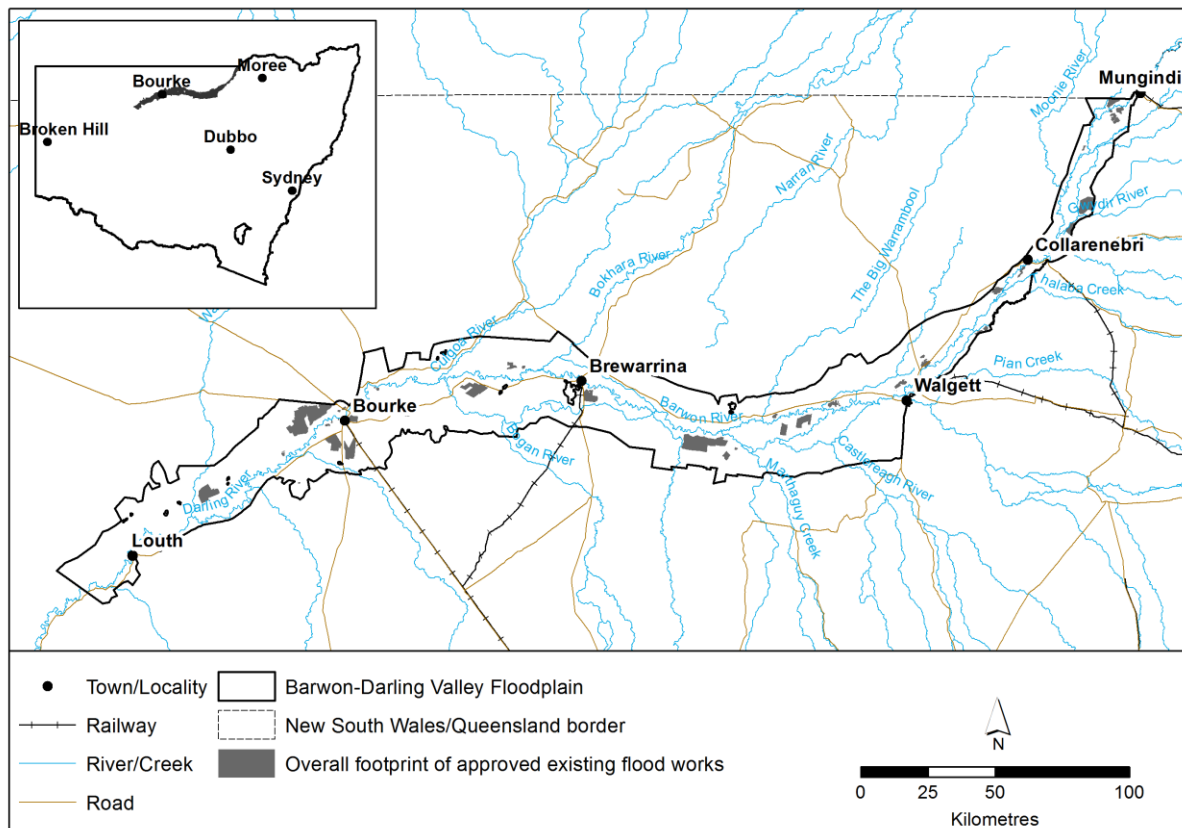
**Wangaaypuwan, Ngemba, Baranbinja and Gunu Reach of the Ecological Assets Map  
(FMP018\_Version 1),**

**Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**

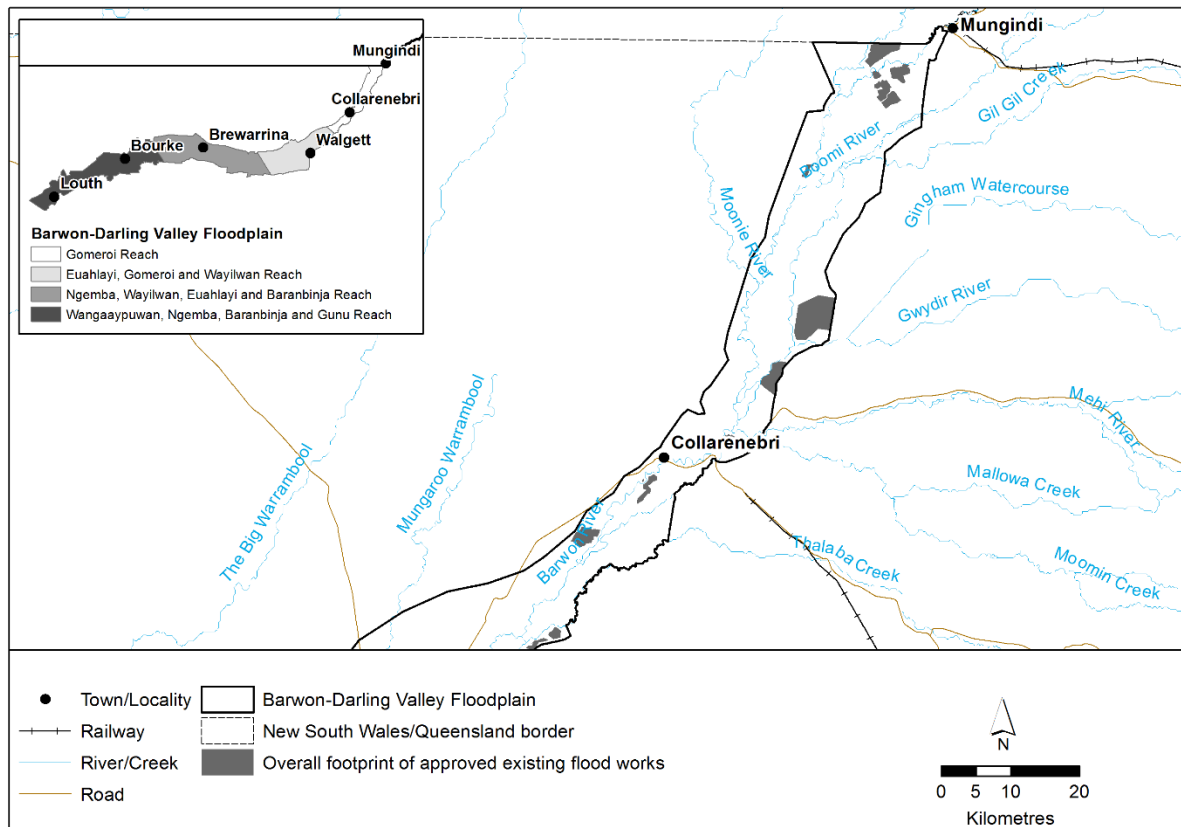


## Appendix 6 Overview of the Existing Flood Works Map

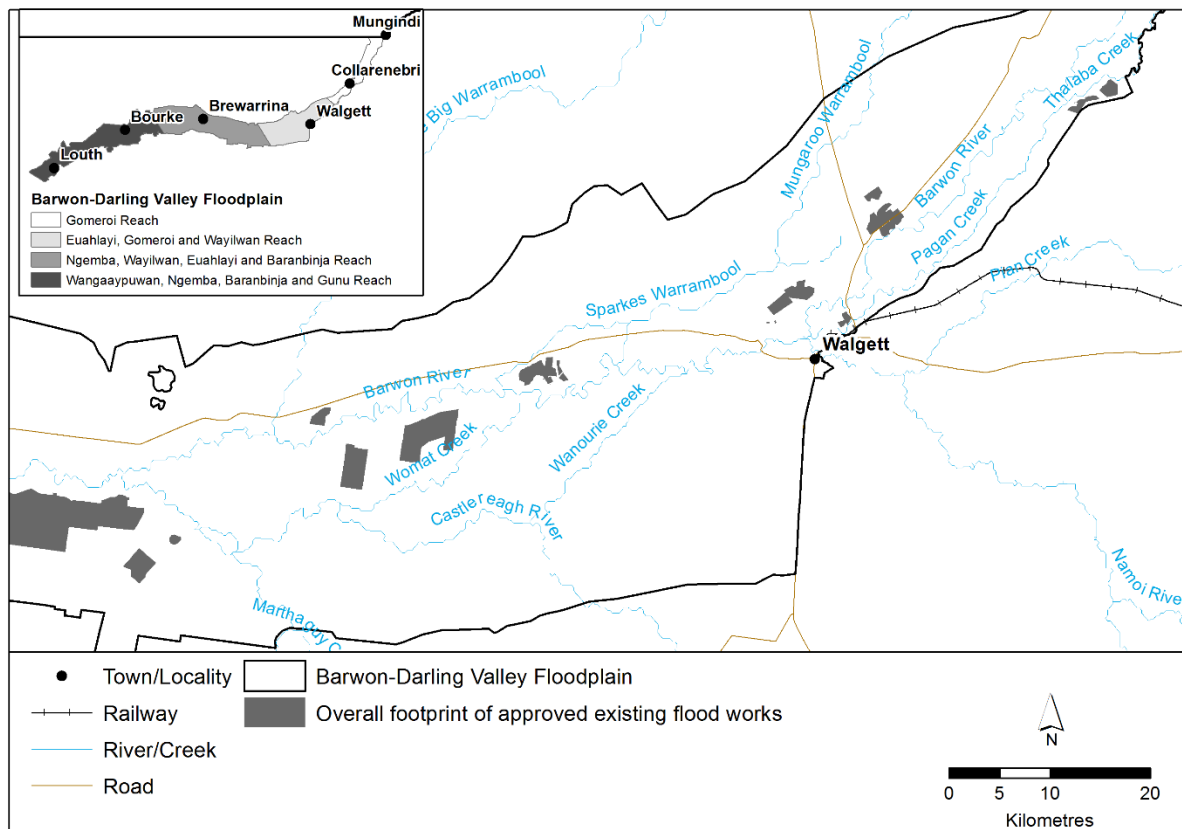
### Overview of the Existing Flood Works Map (FMP019\_Version 1), Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017



**Gomeri Reach of the Existing Flood Works Map (FMP019\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**

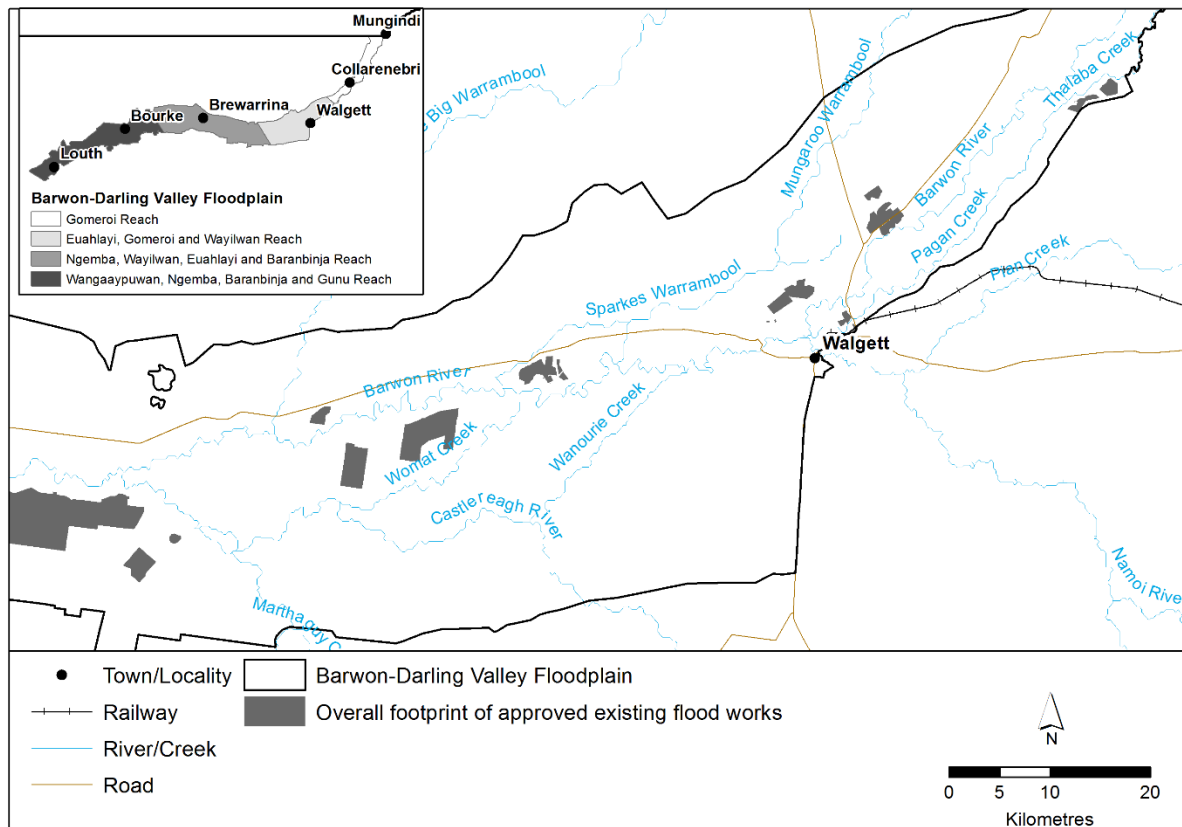


**Euahlayi, Gomeri and Wayilwan Reach of the Existing Flood Works Map (FMP019\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



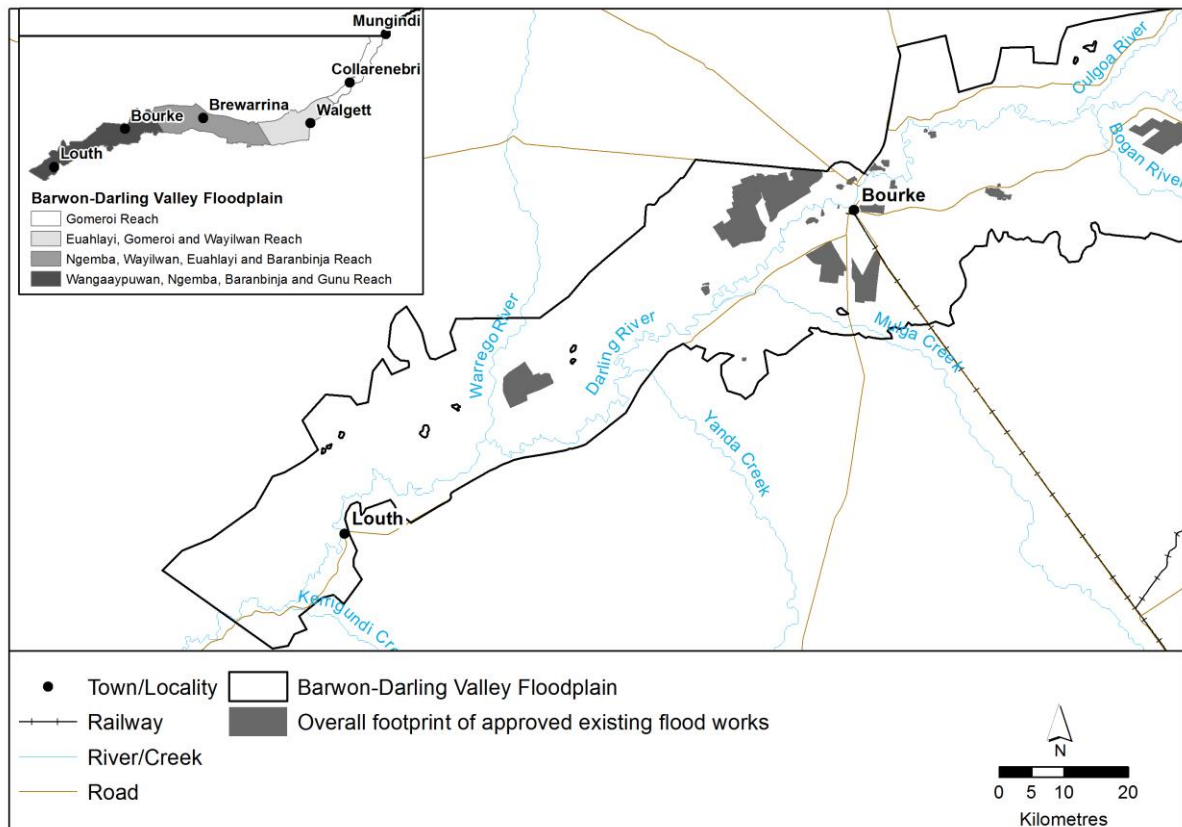
**Ngemba, Wayilwan, Euahlayi and Baranbinja Reach of the Existing Flood Works Map  
(FMP019\_Version 1),**

**Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



**Wangaaypuwan, Ngemba, Baranbinja and Gunu Reach of the Existing Flood Works Map  
(FMP019\_Version 1),**

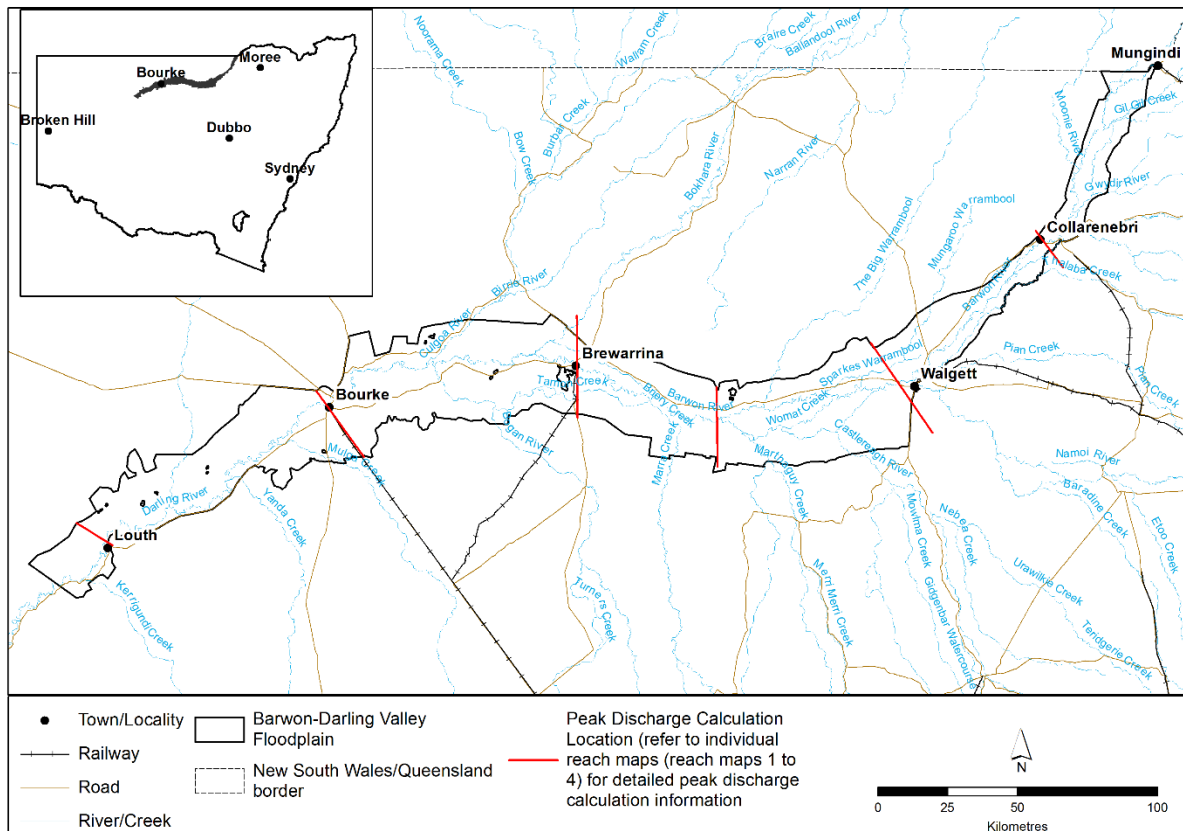
**Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**





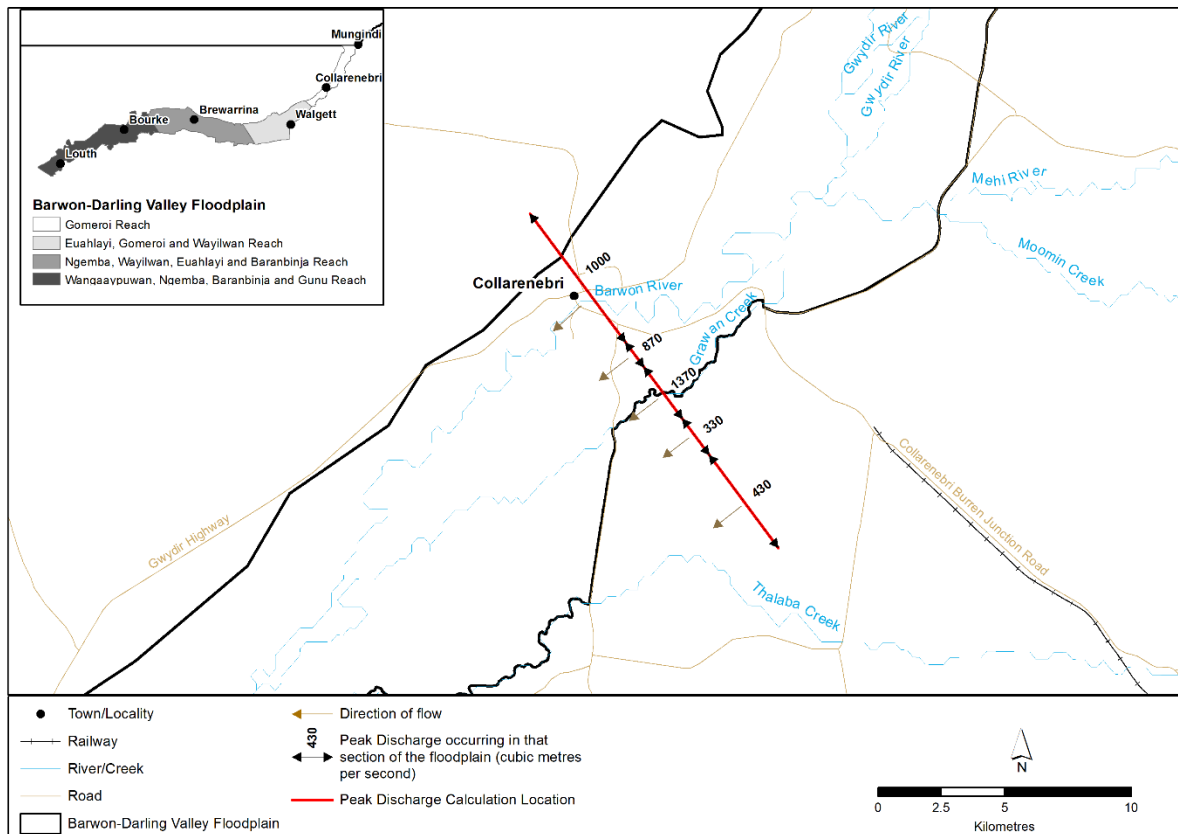
## Appendix 7 Overview of the Peak Flood Flow Distribution (1976) Map

### Overview of the Peak Flood Flow Distribution (1976) Map (FMP020\_Version 1), Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017



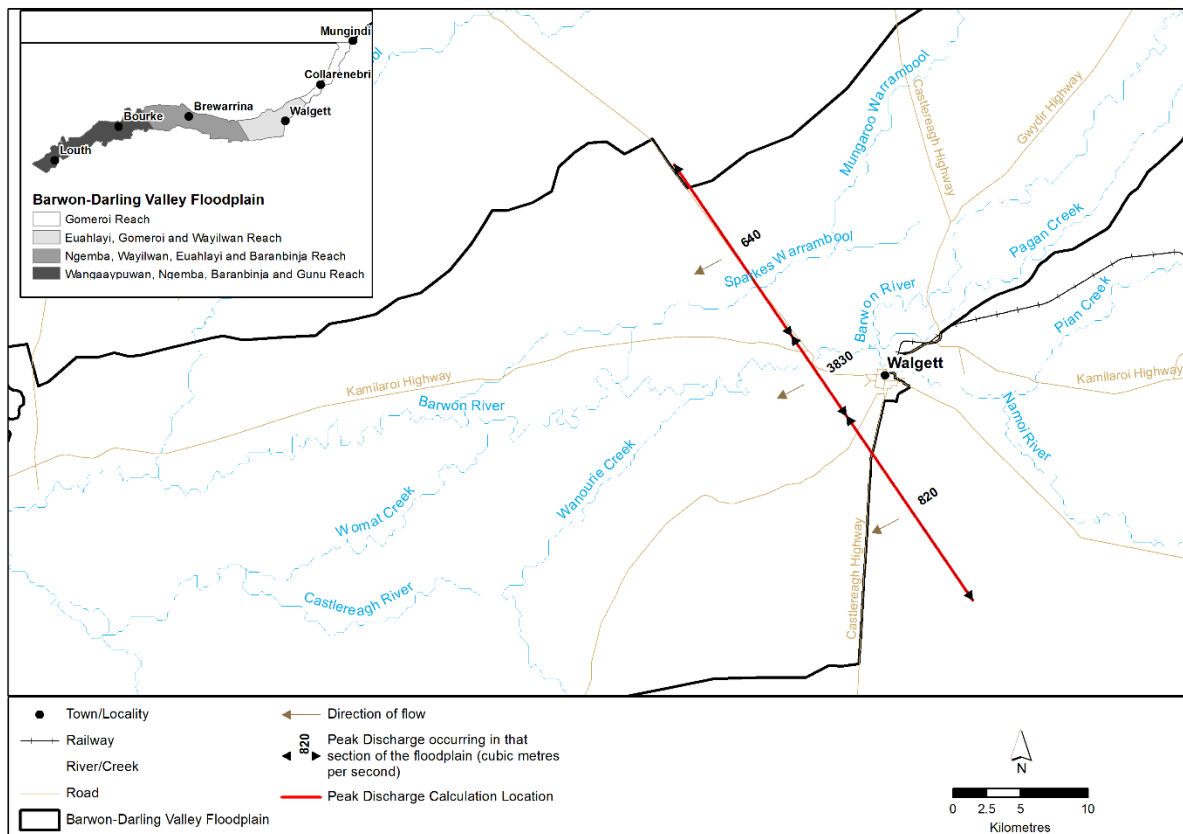


**Gomeri Reach of the Peak Flood Flow Distribution (1976) Map (FMP020\_Version 1),  
Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



# **Euahlayi, Gomeroi and Wayilwan Reach of the Peak Flood Flow Distribution (1976) Map (FMP020\_Version 1),**

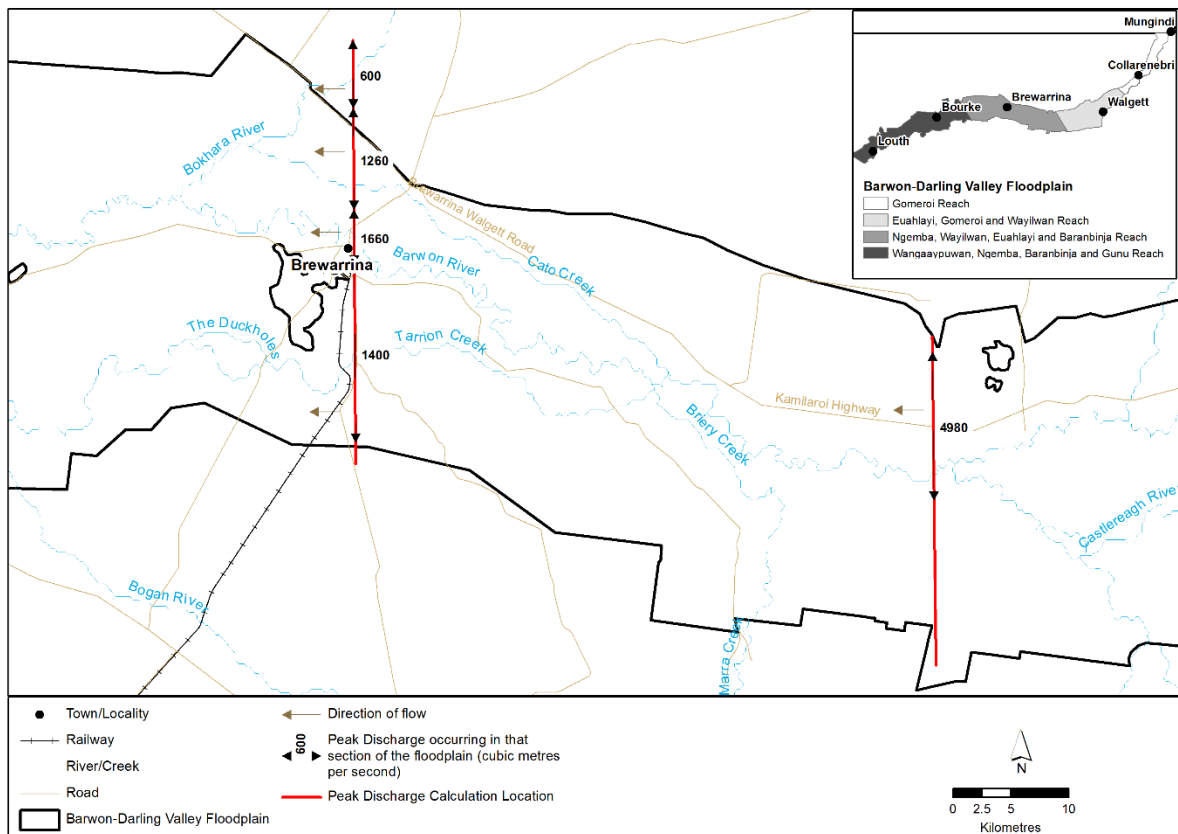
## **Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**



# Ngemba, Wayilwan, Euahlayi and Baranbinja Reach of the Peak Flood Flow Distribution (1976)

Map (FMP020\_Version 1),

## Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017



# **Wangaaypuwan, Ngemba, Baranbinja and Gunu Reach of the Peak Flood Flow Distribution (1976) Map (FMP020\_Version 1),**

## **Floodplain Management Plan for the Barwon-Darling Valley Floodplain 2017**

