Waterway Health Strategy
Background Report

2020

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City of Ipswich

CONTENTS

Brisbane River, Goodna by K Petie
Ipswich Enviroplan Photo Competition

A. BACKGROUND AND CONTEXT

Splashdown by R Turner
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PURPOSE AND USE

The Waterway Health Strategy Background Report describes the condition and vision for the waterways within the Ipswich Local Government Area (LGA).

The intent of this report is to provide current technical background information on the values and threats facing Ipswich waterways which has assisted in the development of the Waterway Health Strategy 2020. The report is set out in four main parts:

PART A
BACKGROUND AND CONTEXT

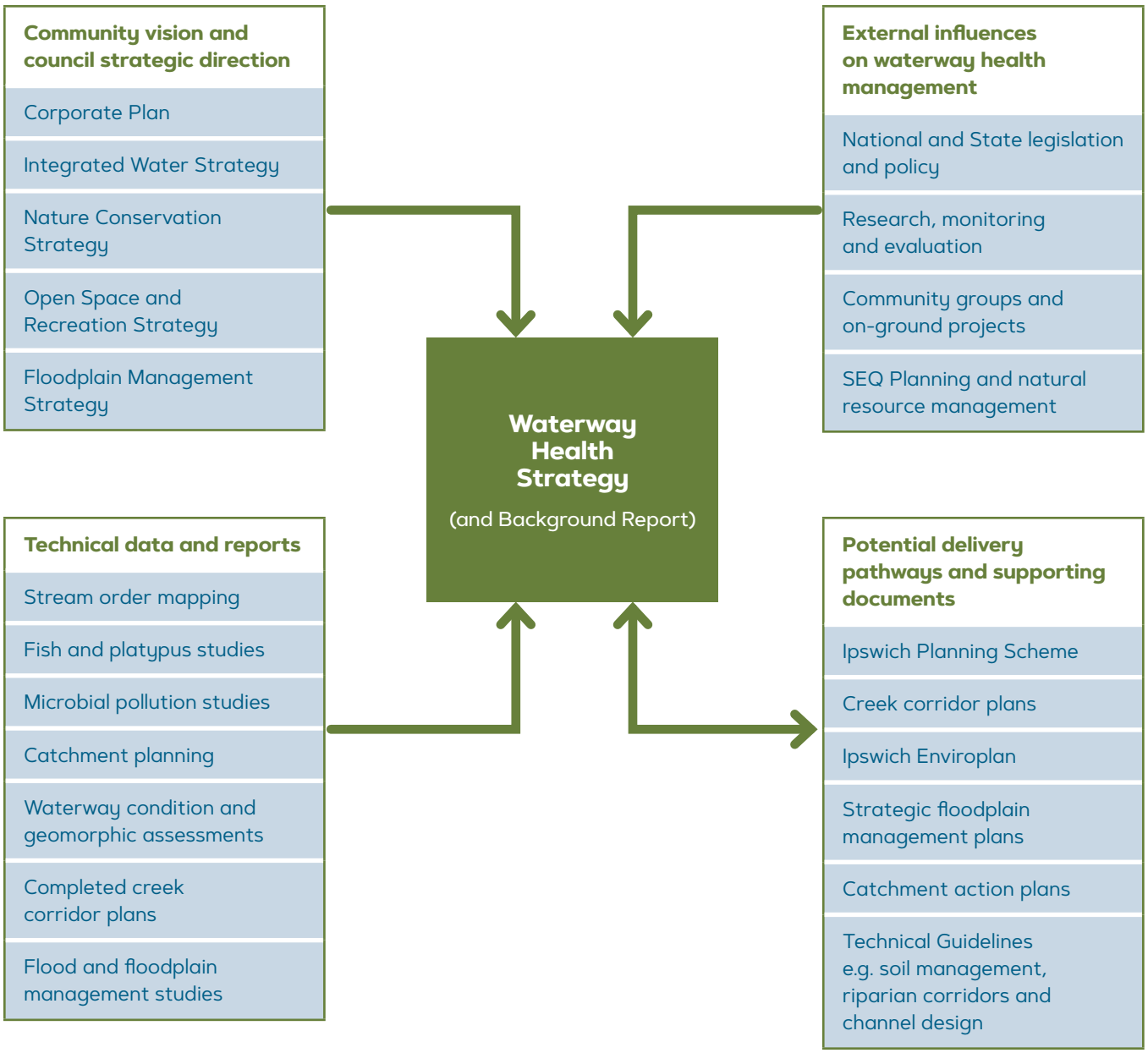
PART B
IPSWICH WATERWAYS AND WETLANDS

PART C
WATERWAY MANAGEMENT ACTION THEMES

PART D
SUB-CATCHMENT SUMMARIES – CURRENT CONDITION

A number of strategies, policies and technical reports which have been produced by council and others link to the Waterway Health Strategy and will assist in achieving its strategic priorities (See Figure 1).

FIGURE 1 – Framework bringing together the internal and external elements of waterway health management to give a clear, coordinated framework for future improvement



STRATEGY DEVELOPMENT

The health of our Ipswich waterways are directly influenced by the condition of and activities in the adjacent riparian corridor, as well as the contributing catchment. Therefore the protection and enhancement of waterway health requires input and cooperation from many stakeholders. To achieve this, the strategy has been developed through coordinated consultation across multiple council departments and stakeholders including:

Infrastructure and Environment

- Natural Environment and Land Management
- Hydrology and Open Space Planning
- Infrastructure Strategy
- City Maintenance

Community, Cultural and Economic Development Department

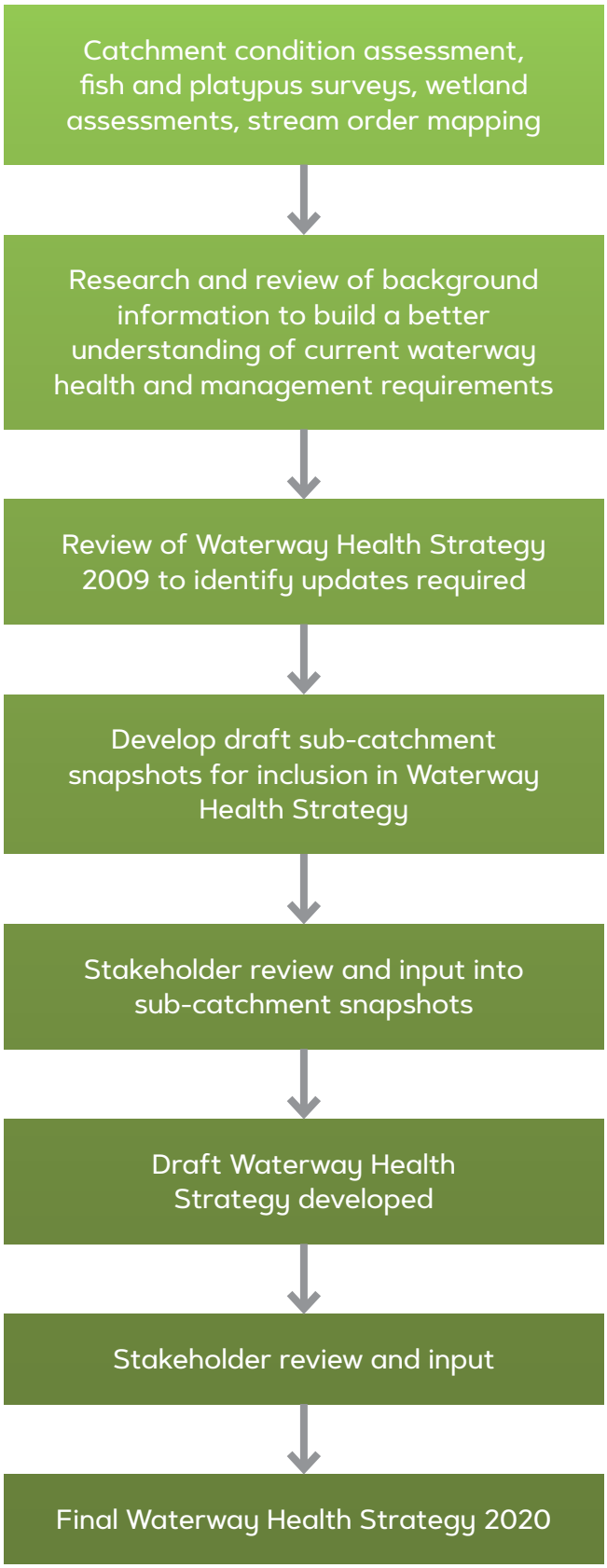
- Sport and Recreation

Planning and Regulatory Services Department

- Engineering, Health and Environment
- City Design.

The Waterway Health Strategy 2020 and Waterway Health Strategy Background Report replaces the Waterway Health Strategy 2009 to reflect the current understanding of Ipswich waterways and their management requirements. Figure 2 represents the process which was undertaken in order to update the Waterway Health Strategy 2009.

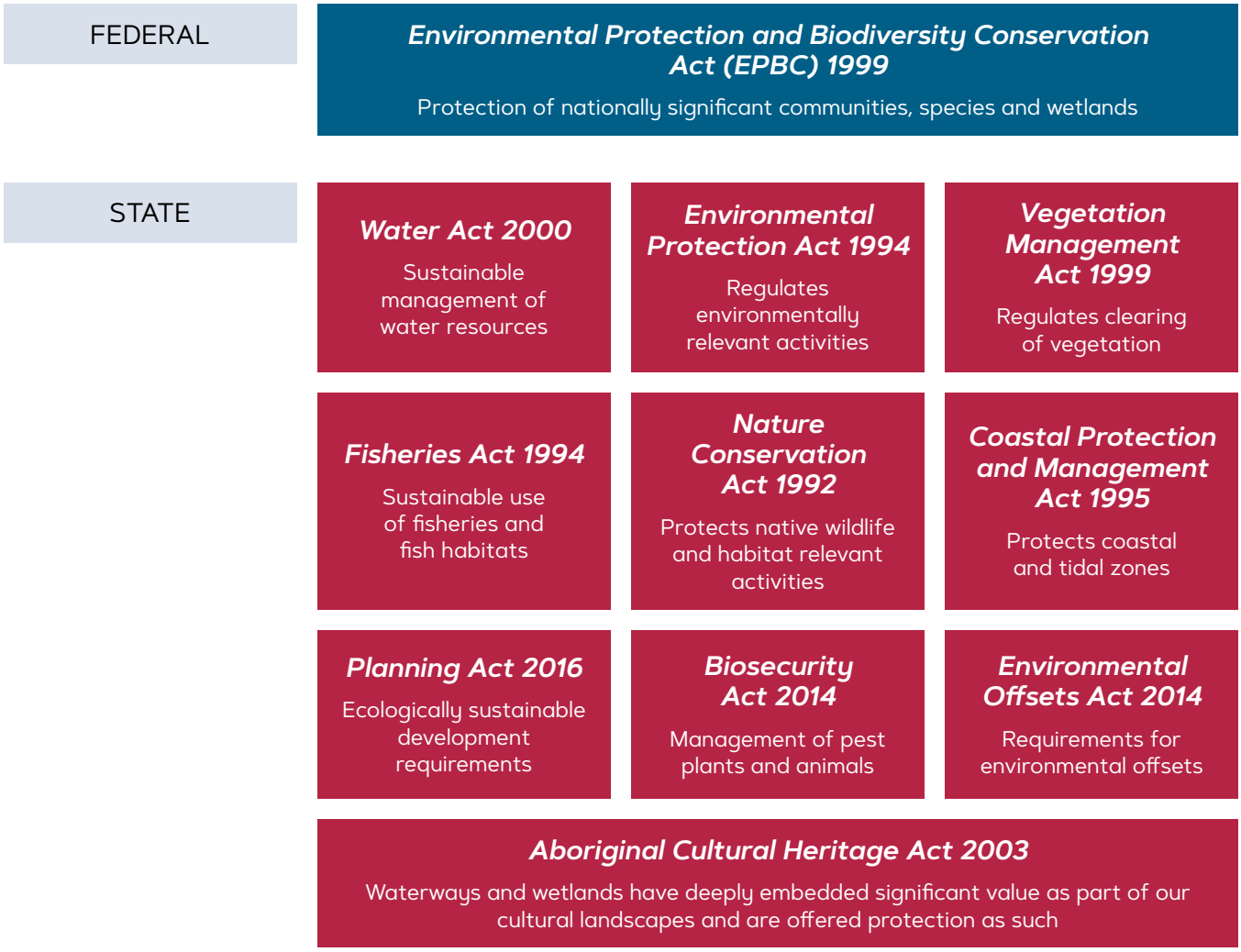
FIGURE 2 – Strategy development process



LEGISLATIVE AND PLANNING FRAMEWORK

Council has an obligation to meet a number of statutory requirements and regional targets for the protection and management of water quality, aquatic ecosystems and riparian vegetation (refer Appendix B for more details). It also has to fulfil State Government devolved responsibilities through regulatory enforcement on public and private land. Figure 3 provides a summary of key waterway and wetland legislation.

FIGURE 3 – Summary of national and state legislation which helps to protect and manage waterways and wetlands



The State Planning Policy 2017 and the SEQ Regional Plan 2017 (ShapingSEQ) both work together as part of Queensland's planning framework under the *Planning Act 2016* to manage growth, change, land use and development in South-East Queensland.

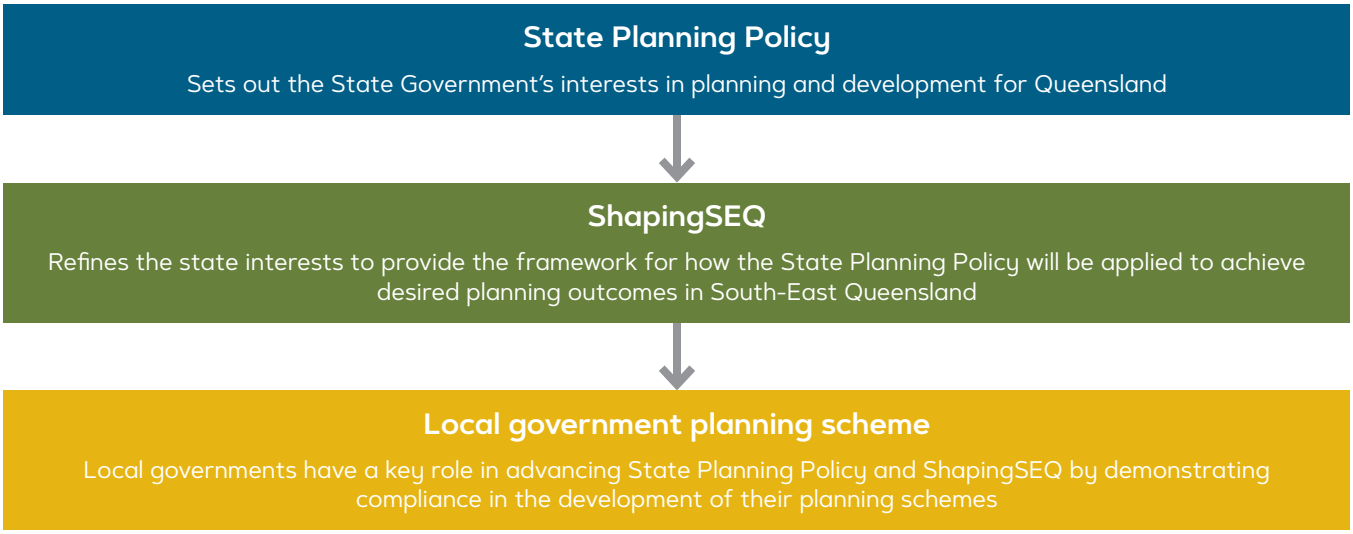


TABLE 1 – The Waterway Health Strategy accords with the following State interests and ShapingSEQ goals:

State Planning Policy Interests	
Biodiversity	Matters of environmental significance are valued and protected, and the health and resilience of biodiversity is maintained or enhanced to support ecological processes.
Water quality	The environmental values and quality of Queensland waters are protected and enhanced.
ShapingSEQ Goals	
Sustain – Element 2: Biodiversity	The regional biodiversity network is protected and enhanced to support the natural environment and contribute to a sustainable region.
Sustain – Element 4: Regional Landscapes	Regional landscape values and functions are sustainably managed and provide social, environmental, cultural and economic benefits to the region.
Sustain – Element 5: Water sensitive communities	Water management in SEQ will use innovative approaches in urban, rural and natural areas to enhance and protect the health of waterways, wetlands, coasts and bays.
Sustain – Element 6: Natural economic resources	The region's natural economic resources are managed sustainably and efficiently to meet the needs of existing and future communities.
Sustain – Element 7: Health and wellbeing	Communities are designed and supported by social infrastructure and natural assets to provide healthy, liveable places that promote mental and physical wellbeing.
Sustain – Element 9: Climate change	The effects of climate change are managed to optimise safety and resilience for communities and the natural environment.
Sustain – Element 10: Safety	Communities are designed and equipped to be safe, hazard-resilient places.
Live – Element 4: Working with natural systems	The liveability and sustainability of SEQ's urban environments are enhanced by incorporating urban greening networks.

B. IPSWICH WATERWAYS AND WETLANDS

ENVIRONMENTAL VALUES AND WATER QUALITY OBJECTIVES

Environment Values and Water Quality Objectives are set in Queensland Government legislation, listed in Schedule 1 of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019. This document achieves the objective of the *Environmental Protection Act 1994* (EP Act) to protect Queensland's waters while supporting ecologically sustainable development.

Environmental Values are the qualities that make water and wetlands suitable for supporting aquatic ecosystems and human use. Water Quality Objectives apply to receiving waters including freshwater, estuarine and marine wetlands.

Specific Environmental Values and Water Quality Objectives have been developed in Schedule 1 for each of the catchments across Ipswich (see Appendix A for more details). They are part of legislation and therefore inform a range of statutory and non-statutory activities related to waterway health management, including development assessments and compliance of environmentally relevant activities ie: point source discharges.

The Environmental Protection (Water and Wetland Biodiversity) Policy sets the management intent for the protection of water quality based on a classification level given to waterways. All waterways in Ipswich have been classified, in consultation with council, as 'Moderately Disturbed Waters' based on their current condition. The management intent for these waterways is:

- Where the existing water quality achieves the scheduled Water Quality Objectives, maintain current water quality
- Where the existing water quality does not achieve the scheduled Water Quality Objectives, improve water quality.

For council, management decisions need to consider other impacts on waterway health, such as catchment condition, land uses, existing and future flow patterns, to determine how it will meet the Water Quality Objectives as only one land manager within a catchment. Those listed in the Policy are therefore referred to as the long-term aspirational targets for Ipswich waterways.

TYPES AND CLASSIFICATION

Waterways and wetlands are described and classified using different methods. The following sections describe the types of waterways and wetlands which may be found in the Ipswich region.

WATERWAY TYPES AND CLASSIFICATION

Waterways are generally defined as areas which provide a passage for water and may look like natural creeks and rivers or grass lined and concrete channels. These waterways may or may not have permanent water in them. Table 2 provides a snapshot of different waterway types and the benefits they typically provide. This table highlights that though a waterway may be in a degraded state, it still provides a number of important waterway services. The table highlights that by reinstating certain characteristics (such as riparian vegetation or in-stream habitat), gradual improvement can be achieved, which increases the benefits provided by the waterway.

TABLE 2 – Waterway types

WATERWAY SERVICES PROVIDED	CHANNEL TYPE CONTINUUM				
	Concrete channel	Grass lined open channel	Vegetated open channel	Natural channel with limited riparian vegetation	Natural channel with intact riparian and floodplain zone
					
Riparian habitat				L	X
In-stream habitat			L	X	X
Water quality improvement		L	X	X	X
Flow conveyance	X	X	X	X	X
Urban cooling		L	L	X	X
Amenity		L	L	L	X
Potential future transformation		→	→	→	→

X = services provided, L = services may be provided depending on the waterway condition

The classification of waterways influences the way in which they need to be managed. The majority of Ipswich waterways have been classified as 'moderately disturbed ecosystems' , which recognises that the aquatic biodiversity may have been adversely affected by human activity. The management plan for these waterways works toward ensuring that the current condition is maintained or improved.

Waterways can be further classified based on their size and position within a catchment. Currently the stream order system is used to classify waterways, based on their status in a hierarchy which ranges from small headwater tributaries (commencing with stream order 1) to large rivers. When two streams of the same order join, the waterway is elevated to the next highest order. The use of other methods such as overland flow mapping can also be used to delineate smaller lower order streams from larger higher order streams.

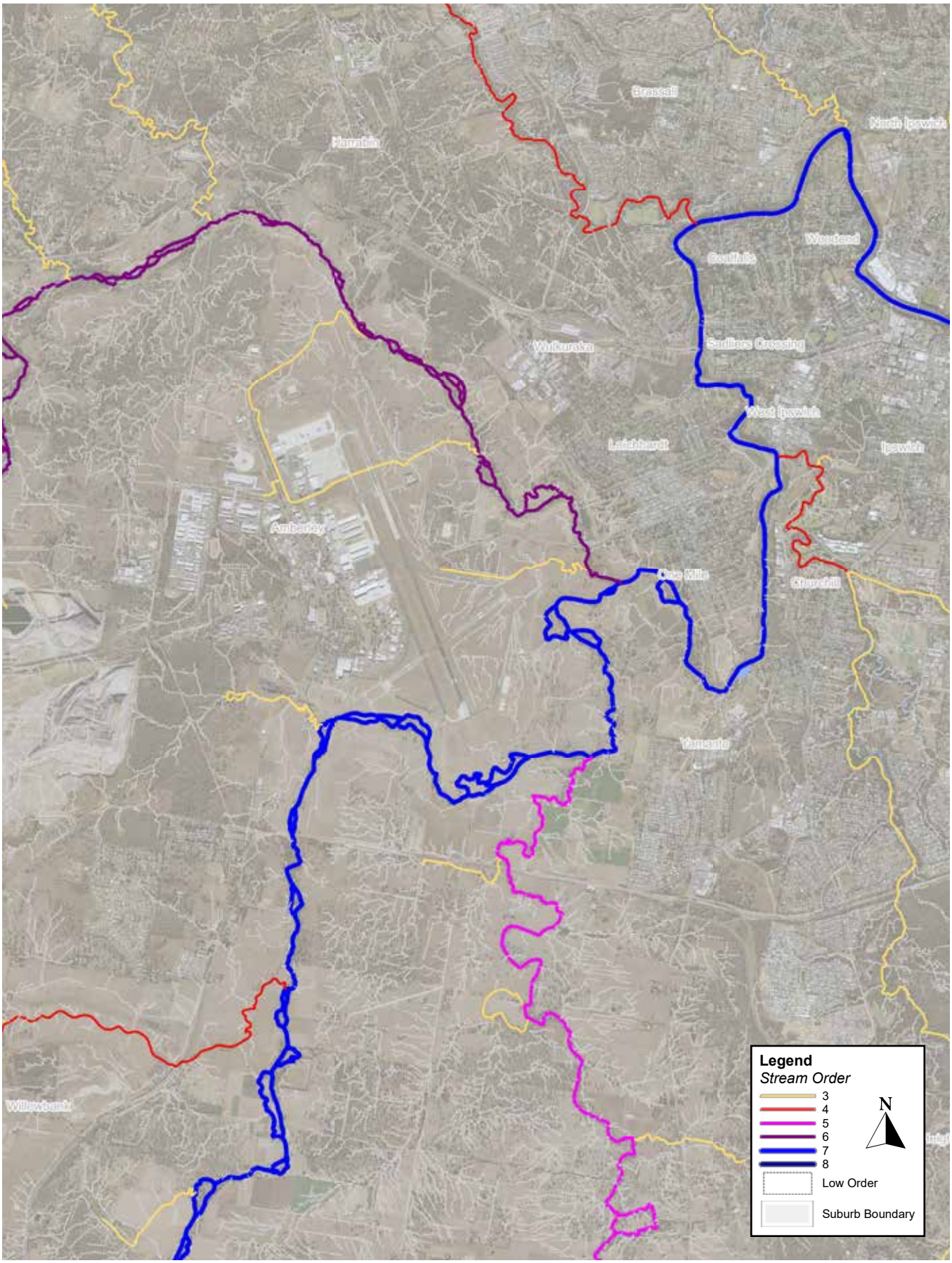
On a collective basis, lower order streams comprise the majority of stream lengths in Ipswich and therefore play a critical role in protecting and maintaining the health of higher order streams and rivers (refer Table 3 and Figure 4) by reducing flow volumes promoting infiltration and supplying critical inputs such as coarse sediment and gravel from the catchment. However, due to their small size and ephemeral nature, many of these waterways have been lost or altered significantly. The important services provided by these smaller waterways can be effectively managed through:

- enhancement through on-ground rehabilitation to restore native vegetation and bank stability, and
- design of stormwater management systems to replicate their functions if protection or rehabilitation is not practical, or protection by planning mechanisms.

TABLE 3 – Total length and percentage of stream orders in Ipswich

Stream order	Total length (km)	Percentage of total stream length in Ipswich (%)
Lower (1 + 2)	10,694	93%
3	378	3%
4	143	1%
5	125	1%
6	44	0.5%
7	64	1%
8	47	0.5%

FIGURE 4 – Example of stream order mapping undertaken in 2015 showing extent of lower order streams in the Ipswich landscape



WETLAND TYPES AND CLASSIFICATION

Wetlands are described as areas of permanent or periodic inundation of static water. There are two main wetland types as described in Table 4.

TABLE 4 – Wetland types

Wetland type	Description	Ecosystem services	Examples
Palustrine	Vegetated wetlands which are located within the floodplain and are not part of the waterway channel. They are mostly formed as depressions in the landscape and may not contain water in dry periods. These wetlands don't stop being wetlands during these dry periods as they are adapted to 'bounce' back to become hot spots of biodiversity when it rains. Many of these wetlands have been lost to development, agriculture, draining and filling.	▪ Habitat/refugia ▪ Movement/connectivity ▪ Flood mitigation ▪ Nutrient and sediment management ▪ Soil management.	 **Examples** – billabongs, swamps, soaks
Lacustrine	Large open water systems which can include modified or artificial systems such as dams. Many of the natural lacustrine wetlands have been modified with levee banks and dam walls which disconnect them from other aquatic systems.	▪ Habitat/refugia ▪ Flood mitigation ▪ Nutrient and sediment management.	 **Examples** – lakes, farm dams

Wetlands in Queensland are identified, classified and assessed by the state government. **Wetlandinfo.ehp.qld.gov.au** can be used to find out where wetlands are located, the type of wetland and its condition. On a collective basis, the non-riverine (lacustrine and palustrine) wetlands in Ipswich are in poor condition based on this source of information.

WATERWAY AND WETLAND MANAGEMENT

The health of waterways and wetlands reflect on land and water resource management within the waterway corridor as well as the broader catchment. Typical negative influences on waterway health include pollution (point source and diffuse), changes in hydrology, loss of riparian and floodplain vegetation and erosion and sedimentation.

Waterway management over the past decade has focused on water quality, through the management of point source pollution (e.g. direct discharge of pollution from wastewater treatment plants and industry) and requiring new urban developments to better manage stormwater, in order to meet best practice pollution reduction and flow management targets. It should be noted that legislative best practice standards are based on the economic treatment efficiency of current stormwater management infrastructure technologies. These technologies are designed to manage only a portion of the stormwater flows generated from new urban areas and therefore there is still an increase in pollutant loads and volumes of wastewater and stormwater entering our waterways. To ensure there is no worsening and improvement of waterway health across Ipswich, it is important that a combination of on-site and catchment management solutions are implemented.

CHALLENGES FOR WATERWAY MANAGEMENT

A number of challenges are faced by council in its management of waterways. The environmental, land use or management challenges are presented in Table 5.

TABLE 5 – Challenges for waterway management

Environmental challenges	Land use challenges	Management challenges
Erosive soils ▪ Highly mobile dispersive soils in most sub-catchments leads to widespread erosion, threats to property and infrastructure, sedimentation and increased turbidity in waterways. **Unstable banks** ▪ Configuration and morphology of receiving waterways with deeply incised banks increases the risk of bank erosion with high volume and/or high velocity flows. **Degraded riparian and floodplain management** ▪ Continual loss and degradation of native vegetation in riparian and floodplains reduces riparian, wetland and in-stream habitats, significantly impacts on water quality and increases vulnerability of river ecosystems to collapse. **Climate change uncertainty** ▪ Projected climate change variability and changed rainfall patterns will polarise base and peak flows and exacerbate degradation patterns.	**Urban areas and increased impervious surfaces** ▪ Greater areas of impervious surfaces associated with urbanisation increases the risk of downstream flooding, increased channel erosion and sediment transport and impacts from 'first flush' inputs of pollutants (nutrients, litter, pesticides, heavy metals and sediments). **Population growth** ▪ Population growth and expanding infrastructure places added pressure on catchments and waterways. **Peri-urban development** ▪ Changing land use practices and demographics in rural areas with an increasing trend towards 'peri-urban' developments. **Rural areas** ▪ Loss of vegetation and unrestricted access of stock in wetlands and waterways. **PFAS and other contaminants** ▪ The occurance of per- and poly-fluoroalkyl substances (PFAS) contamination in waterways in Ipswich has highlighted the risk that land use activities can have on waterway health.	**Enforcement** ▪ Capacity to strengthen enforcement of erosion and sediment control and pollution discharges, using a combination of regulatory and educational mechanisms. **Staff capacity** ▪ Increasing internal knowledge and skills to address waterway health issues and management requirements. **Resources** ▪ Commitment of resources and investment to the delivery of management actions. **Roles and responsibilities** ▪ Developing a clear definition and agreement on the roles and responsibilities of all stakeholders. **Partnerships** ▪ Developing and supporting strong partnerships with private landholders, non-government organisations, regional NRM bodies and all levels of government to align waterway health management. **Monitoring** ▪ Capacity to monitor and evaluate the success of management actions.

STRATEGIC WATERWAY MANAGEMENT DECISION-MAKING

Waterways in Ipswich will face continued pressures associated with land use change, population growth and urban development, but this brings opportunities to manage the impacts to drive towards the future vision. It is important to understand that transformation requires time, partnerships and investment and will involve multiple stages. An upfront investment in waterway health protection and enhancement, can result in avoided future costs associated with waterway rehabilitation, water quality improvement and sediment capture.

Economic rationale for investing in waterway health

Sharing the Load, a report by Mainstream Economics and Policy in 2011 identified that at the time, the value of avoiding further decline in coastal, marine and inland waters across South-East Queensland over the next 20 years would be approximately $2 billion.

- **Avoided costs in downstream waterway rehabilitations**
  Appropriate management of stormwater within urban developments can potentially result in avoided costs (on average $34,000/ha) associated with rehabilitation of downstream waterways which have been impacted by increased flows and pollution.[1]
- **Water quality improvements**
  If urban land uses manage pollutants before they are discharged to waterways, it can result in the removal of the Total Nitrogen (an addition nutrient) that would cost on average $3,360–$7,860/ha/yr to remove in an equivalent wastewater treatment.[2]
- **Sediment management**
  Protecting waterways through effective management is often cheaper than treatment at a treatment plant. Modelling undertaken in 2009 identified that a conservative assumption of a 10 per cent increase in turbidity by 2031 would increase water treatment costs by approximately $16M each year.[3]

Waterway health management activities should be informed by an understanding of the current condition, local context and likely outcomes of the planned activities identified within the waterway corridor and its catchment. This approach allows an appropriate future target for each waterway to be developed, which reflects both its current condition and likely future trajectory. Appropriate actions can then be developed to achieve the overall target for the waterway corridor. For example urban waterways corridors are likely to be more constrained than rural waterway corridors, as they typically need to accommodate multiple outcomes in a designated area including flood conveyance, areas for recreation and open space, infrastructure as well as providing ecosystem services.

Section D provides an overview of the current condition of Ipswich sub-catchments.

1 'Valuation of economic, social and ecological costs and benefits of strategies and systems for water sensitive cities', CRC for Water Sensitive Cities
https://watersensitivecities.org.au/wp-content/uploads/2016/05/FS_A1-2_ValuationEconomicSocialEcologicalCostsBenefitsWSC.pdf

2 'Business Case for Best Practice Urban Stormwater Management' Water by Design
http://hlw.org.au/resources/documents?topic-Water+By+Design&category-0&term-business+case

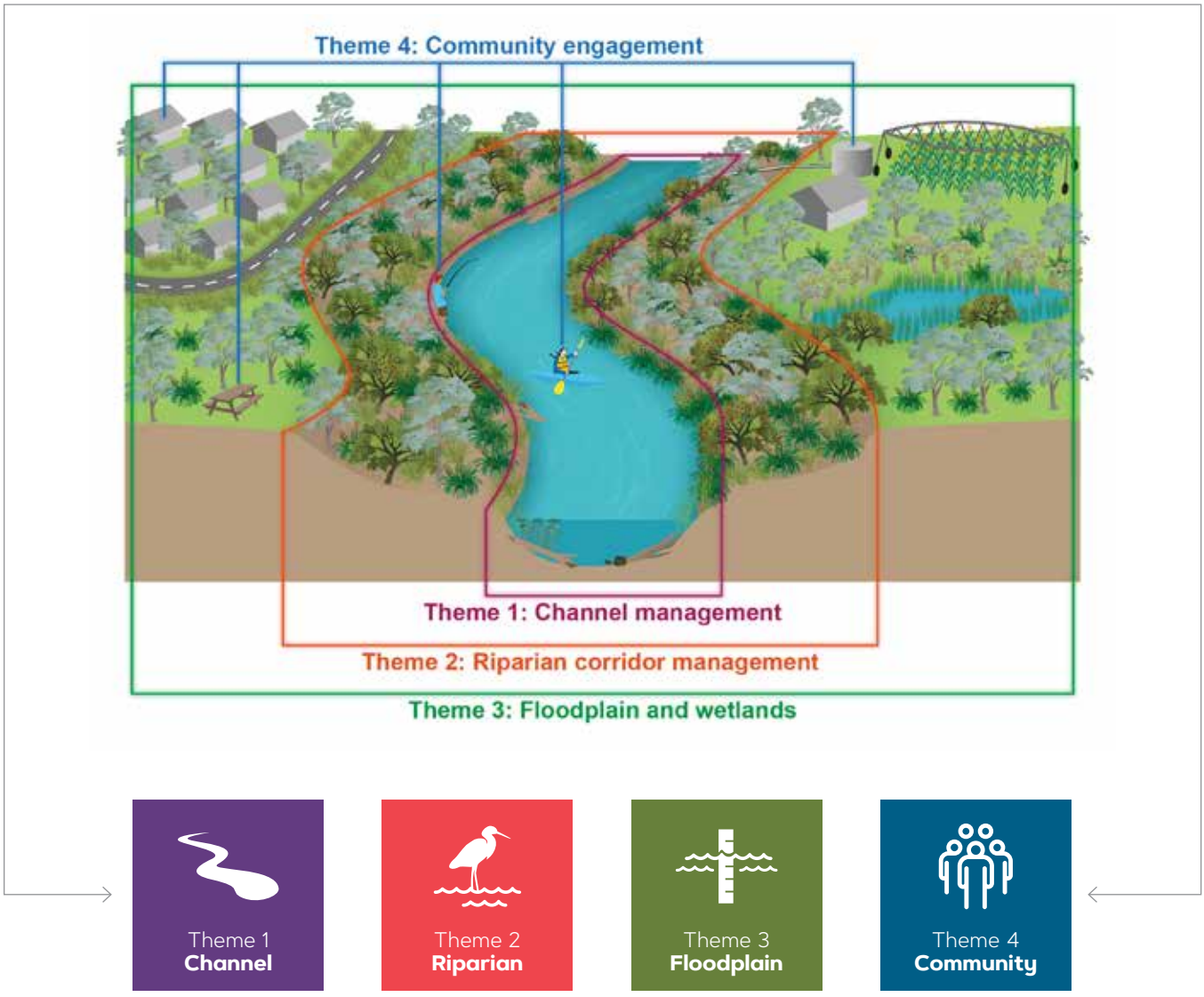
3 'Managing what matters: The cost of environmental decline in South East Queensland, prepared for South East Queensland Catchments
http://www.seqcatchments.com.au/managing-what-matters.html

C. WATERWAY MANAGEMENT ACTION THEMES

The waterway channel, riparian and floodplain zone are referred to collectively as the waterway corridor in this strategy. The inclusion of the community as the fourth management action theme reflects the important role the community plays in improving waterway health across Ipswich (see Figure 5). While it is recognised that groundwater interactions are also important within waterway corridors it is not a focus of the strategy as there are currently considerable knowledge gaps.

This section provides an overview of each of these management action themes, describing their importance, threats and management considerations.

FIGURE 5 – Management Action Themes identified to guide investment



Description

What is a waterway channel?

A waterway channel is defined in this strategy as a depression in the land which conveys water, including large rivers and smaller creeks which permanently hold water, as well as smaller channels which only convey water after rain. The channels can be in a natural state or may have been modified with the use of rock or concrete.

A healthy waterway channel will typically consist of the following attributes:

- stable bed and banks
- good water quality
- diversity of habitats (riffles, pools, woody debris, etc).

The importance of waterway channels

Waterway channels provide a range of important values including:

- in-stream habitat for native fish, platypus and macroinvertebrates
- conveyance of water
- water source for drinking, agricultural or industrial uses
- recreation including fishing and kayaking.

Threats to waterway channels

Waterway channels are impacted directly by activities in the channel or adjacent riparian zone as well as in the contributing catchment in four ways:

1. Bed and bank stability

The bed and banks of waterway channels can be directly impacted by activities in the waterway channel (such as grazing or infrastructure works) and the removal of riparian vegetation resulting in exposure of bare banks, which are susceptible to erosion. The urbanisation of catchments increases stormwater volumes directly entering the waterways through a stormwater pipe network, which also contributes to the erosion of the channels.

2. Water quality

Water quality in waterways is impacted by increased pollutants (such as nutrients, sediments and carbon) as well as increased salinity in a number of ways:

- Nutrients are a major threat to water quality in Ipswich waterways and come directly from wastewater treatment plants, industrial activities and are also carried in stormwater runoff from urban and rural areas
- Excess carbon loads drive the primary production of algae and bacteria which deplete dissolved oxygen levels in the waterway which impacts the aquatic biota in the channel
- High sediment loads come from new urban developments, rural activities, unsealed roads and unstable channel beds and banks
- Salinity impacts land and water biodiversity, productivity of agricultural land and the lifespan of infrastructure and occurs where mineral salts within the soil are carried to the surface with rising ground water. This is primarily caused through the removal of deep-rooted native vegetation.

3. Habitat

Channel habitat diversity is impacted directly when channels are modified, for example when natural channels are converted into grassed or concrete channels, or from erosion and sediment deposition which results in the removal or smothering of channel habitat structures. The removal of riparian vegetation will also result in the reduction of large woody debris deposition into the channel which provides important habitat.

4. Loss of small lower order streams

Small lower order streams are often lost or altered significantly due to their small size and ephemeral nature. Not only does this remove an important habitat, but it can also have large impacts on downstream waterways. For example, many lower order streams are converted into piped networks in urban developments. This conversion means that instead of surface runoff being conveyed in a vegetated depression which provides filtering and encourages infiltration, it enters a pipe which conveys the flows into a larger stormwater network and then directly into a waterway, causing water quality and bed and bank stability issues.

Management approach

Waterway channel management is a complex issue as the channel condition is impacted both directly by activities within the channel as well as by broader catchment activities. Therefore the management approach also needs to be diverse.

Bed and bank stability

- Within the channel stock access should be restricted into waterways and native vegetation should be retained or replanted in areas where works are undertaken
- Catchment-wide, the amount of impervious surfaces which are directly connected to waterways in the stormwater pipe network should be reduced.

Water quality

- Point source solutions should include a wastewater treatment plant upgrade in which council has invested heavily in the past and this has resulted in the first major increase in water quality improvement
- Catchment-wide solutions must include reducing diffuse pollution at the source. As an example, council has adopted stormwater management, erosion and sediment control requirements for new developments.

Habitat

- Within the channel a solution should use the natural channel design in order to rehabilitate waterways
- Catchment-wide, erosion and sediment on development sites and rural properties should be reduced as this lowers the volume of sediments entering the waterways.

Protection of lower order streams

- Within channel solutions should include looking for opportunities to retain lower order streams and improve their function in terms of flow conveyance, stability, habitat and landscape cooling
- A catchment-wide solution must include replicating the function of lost lower order streams, with the design of stormwater management systems to promote detention, infiltration and treatment of flows.

Current requirements

There are a number of state and local government policy and planning tools which aim to protect waterway channels from pollution and erosion.

The health of waterways in Queensland is predominately protected under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 which provides environmental values and water quality objectives which define the uses and long-term water quality goals for waterways.

The level of protection required for the waterway is based on its current condition. The State Planning Policy sets out requirements for development across Queensland to manage stormwater and wastewater in ways that supports the protection of environmental values identified in the Environmental Protection (Water and Wetland Biodiversity) Policy 2019. This includes setting stormwater management design objectives to manage the quality and quantity of stormwater entering waterways from developments.

Ipswich City Council's main tool for waterway protection is through its Planning Scheme, developed to reflect the state level requirements for waterway protection, including requirements related to the protection of natural hydrologic behaviour of catchments and protection of water quality. There are also a number of other council strategies and tools which support the protection and enhancement of waterway health including the Integrated Water Strategy 2015 and the Waterway and Channel Rehabilitation Guidelines. Extensive mapping and validation has been undertaken to identify all stream orders across Ipswich which can be used to inform stream order protection.

Council's stormwater quality offset framework also enables investment to be focused on landscape scale projects which will improve channel condition, reduce the amount of sediment and nutrients in the waterways and deliver multiple benefits. Projects which have been funded as part of this program include stock fencing and riparian revegetation in rural catchments.

Management focus

- Erosion and sediment control and operational management of water quality and flows from urban development to provide best practice protection from pollution and changes in hydrology
- Appropriate design of natural channels as part of rehabilitation works to provide future resilience and habitat for native flora and fauna
- Protection of lower order streams or replication of their function in order to protect ephemeral habitats, provide landscape cooling and manage the bulk of flows across the catchments.

CASE STUDY
POLLARD PARK WATERWAY STABILISATION

Pollard Park in Camira contains a low order stream that is tributary of the ecologically significant Sandy Creek. The catchment contains a variety of land uses including bushland, residential and commercial areas, the development of which has caused and accelerated erosion in recent years. The erosion of this park is a threat to infrastructure, in addition to contributing excessive sediment and nutrient loads to the downstream waterway.

Council is using developer stormwater quality contributions to improve the waterway and prevent erosion issues through the construction of grade control structures, rock pools and revegetation. This will halt the export of sediment and nutrients from erosion downstream and improve the quality of runoff from the catchment. To improve the quality of water and restore base flow conditions, filtration basins have also been constructed which will assist in the removal of stormwater pollutants and reduce runoff to the receiving waterway.

Description

What is a riparian corridor?

Riparian corridors are the area of land adjoining a waterway, providing a buffer between terrestrial and aquatic environments.

They provide important connected green corridors along a length of a waterway from the small headwaters to the larger channel areas downstream. Healthy riparian corridors have the following characteristics:

- contain structural and species diversity of native vegetation
- exist in continuous stands along the waterway
- be of a minimum width to perform specific functions.

The importance of riparian corridor

Riparian corridors provide the following benefits:

- hold bank soil in place and reduce the risk of bed and bank erosion
- filter sediments and nutrients from surface run-off and groundwater
- regulate water temperature
- provide corridors for fauna movement, habitat and food along the length of waterways
- support in-stream ecosystems by dropping woody debris and organic materials
- provide shade to regulate water temperature, 'shade out' weeds and create cool landscapes for the community
- intercept and reduce the volume and frequency of stormwater runoff entering waterways
- improve the visual amenity and property values along waterways.

Threats to riparian corridors

A threat to riparian corridors is their reduced width through removal for urban, peri-urban and rural land use practices. The condition and health of riparian corridors has a greater impact on the health and condition of aquatic ecosystems than land use practices alone, as the removal of riparian vegetation is linked to channel erosion which is a major source of nutrients and sediments reaching Moreton Bay.

Another threat to riparian corridors is the invasion of exotic grasses and woody weed species. Riparian corridor condition is heavily affected by the loss of native riparian vegetation and subsequent dominance of introduced species of woody weeds, grasses and vines.

Exotic weed species in riparian areas can have a myriad of impacts on surrounding land and water ecosystems including altering soil nutrient processes, impacting upon native aquatic food webs and inhibiting the recolonization and growth of native species. The number one riparian woody weed in Ipswich is Chinese celtis, *Celtis sinensis* (also known as Chinese elm).

The loss of native riparian vegetation across Ipswich impacts the ability of riparian corridors to protect waterways from erosion and poor water quality or provide habitat, shade and visual amenity.

Management approach

As the key interface between different catchment land uses and the waterway channel, riparian lands can be owned by a range of stakeholders and be either private or public land. Therefore the management of this land requires a partnership approach between all users, owners and managers for any development, major infrastructure, parks and open spaces and revegetation projects. Table 6 provides a snapshot of the types of activities and delivery mechanisms which can be undertaken to manage riparian lands.

TABLE 6 – Riparian land management activities and delivery mechanisms

Delivery mechanisms	
Private rural land	▪ Landholder partnerships ▪ Land for wildlife ▪ Offset initiatives ▪ Legislative vegetation management requirements.
Private urban lands	▪ Landholder partnerships ▪ Habitat gardens.
Public land (e.g. parks)	▪ Community planting days ▪ Habitat connections program ▪ Corporate planting days ▪ Offset projects.
New urban and industrial developments	▪ DA requirements ▪ Best practice guidance.
Infrastructure projects (e.g. roads)	▪ Integrated design approach ▪ Best practice guidance.

Riparian corridor widths

The width of the riparian corridor influences how effectively it can filter surface flows, stabilise banks, and provide habitat and shade. Figure 6 presents a schematic representation of a riparian corridor, its key functions and the zone of influence for these functions. This diagram highlights that the wider the riparian corridor, the more services it will be able to provide. For example, to increase biodiversity and support native flora and fauna, the corridor needs to be wide enough to reduce edge effects, while bank stability can be provided by a narrower width of vegetation.

Optimal riparian widths can range from 5m to 200m depending on the landscape context for the waterway (e.g. urban vs rural), the management objective (e.g. surface water filtering vs terrestrial habitat) and the size of the waterway (e.g. lower order stream vs high order stream). The feasibility of providing wide riparian zones will be influenced largely by adjacent land uses, but it should be recognised that reducing riparian widths, will reduce the function provided by this vegetation.

Minimum riparian corridor widths from the top of bank were developed for the previous Waterway Health Strategy following a review of other local council and state government requirements. These widths remain relevant based on current research and provide a balance between the size of the waterway channel, and width required from the riparian zone, to provide the greatest benefit. For example, a 10m wide riparian corridor will have considerable influence on the stability and water quality of a small, lower order stream, but would have limited influence on these functions in a wide, major waterway. These widths would ideally be applied to both sides of the waterway.

FIGURE 6 – Schematic representation of the zones of influence within a riparian zone (based on Clerici et al, 2013)[4]

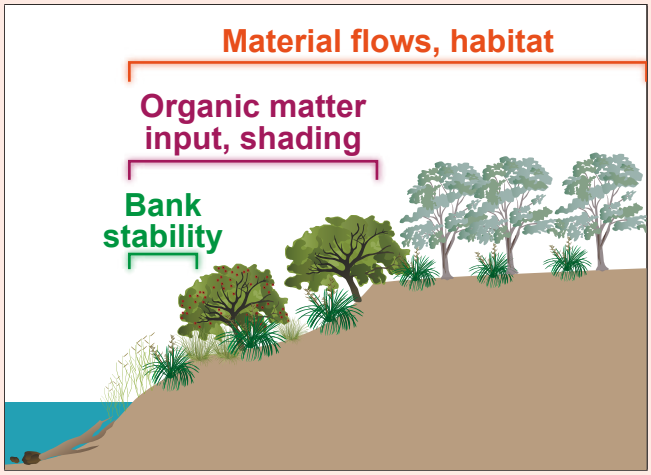


TABLE 7 – Recommended minimum riparian corridor widths

Wetland type	Stream order	Minimum riparian corridor width for each side of the waterway
High order waterways	5 and above	50 metres
Middle order waterways	3 and 4	25 metres
Low order waterways	1 and 2	10 metres

4 Nicola Clerici, Christof J. Weissteinera, Maria Luisa Paracchinia, Luigi Boschettib, Andrea Baraldib and Peter Strobla (2012) 'Pan-European Distribution modelling of stream riparian zones based on multi-source Earth Obeservation data'

TABLE 8 – Minimum riparian corridor widths, based on stream order for major waterways in Ipswich

Waterway category	Low order		Middle order		High order			
Stream order	1	2	3	4	5	6	7	8
Riparian widths	10m	10m	25m	25m	50m	50m	50m	50m
Black Snake Creek								
Bremer River								
Brisbane River								
Bundamba Creek								
Deebing Creek								
Franklin Vale Creek								
Goodna Creek								
Ironpot Creek								
Mihi Creek								
Mountain Creek								
Opossum Creek								
Plain Creek								
Purga Creek								
Sandy Creek (Camira)								
Sandy Creek (Tivoli)								
Six Mile Creek								
Warrill Creek								
Western Creek								
Woogaroo Creek								
Lockyer (Woolshed) Creek								

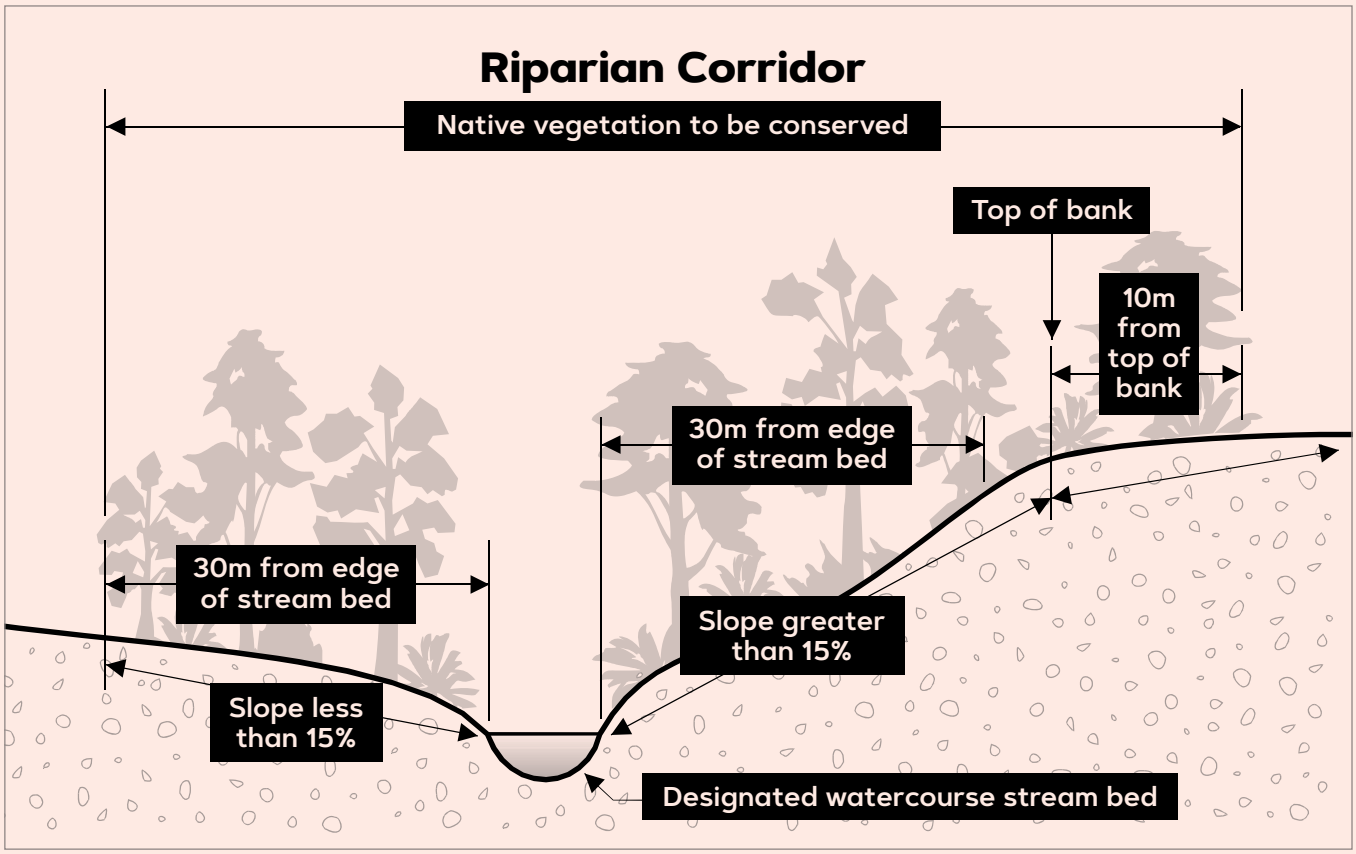
Weed management

Management of riparian lands should aim to protect existing native vegetation wherever practical, and ensure that local native species are used when revegetation is undertaken. Weed control should also be undertaken on identified environmental and declared weed species as described in council's Riparian Corridor Revegetation Guideline.

Current requirements

A range of government policies and legislation may come into play when working within riparian corridors. For example, the clearing of vegetation in Queensland is regulated by the *Vegetation Management Act 1999* and the *Planning Act 2016* while the conservation of natural resources is also regulated by the *Nature Conservation Act 1992* and the *Environmental Protection and Biodiversity Act 1999*. Weed control is regulated under the *Biosecurity Act 2014*. Ipswich City Council's Planning Scheme has also been developed to reflect these requirements. For example, the vegetation management code restricts clearing of native vegetation from land within 30m from the waterway edge or within 10m of the top of the bank, where the slope of the bank exceeds 15 per cent (refer Figure 10). These requirements are currently only applicable for designated watercourses which only include the large, major waterways in Ipswich and is limited in its ability to ensure protection and rehabilitation of riparian corridors, for waterway health outcomes, in smaller waterways across Ipswich.

FIGURE 7 – Defining extent of riparian corridor for protection of native vegetation (from Vegetation Management Code)



The Local Government Infrastructure Plan – Supporting Document: Public Parks (2016) sets some clear principles for the fit-for purpose works required for drainage and waterway channels (typically top of bank to top of bank) within parks, to be constructed and rehabilitated, in order to achieve a fully vegetated corridor outcome.

In addition to relevant legislation and policies, there are also a number of Ipswich City Council strategies that support riparian land management including the Nature Conservation Strategy 2015 and Integrated Water Strategy 2015. Council's Riparian Corridor Rehabilitation Guideline also provides guidance on the reinstatement of native vegetation along Ipswich waterways, including recommended minimum vegetated widths for all waterways (not just major designated waterways) and weed control techniques.

Management focus

- Protect suitable riparian corridors where practical on both sides of waterways, or replicate the ecosystems services lost, to ensure multiple benefits can be provided across Ipswich waterways
- Removal of exotic weeds and replacement with native vegetation to protect and enhance native biodiversity.

CASE STUDY
HABITAT CONNECTIONS – BUNDAMBA CREEK

Since 2012 Bundamba Creek has been one of a number of focal waterways and sites for the Habitat Connections program. Habitat Connections is an investment strategy aiming to create and enhance riparian corridors in and around Ipswich.

Bundamba Creek provided a good location for this program, with the waterway containing some of the remaining native vegetation in the catchment. Beginning around Mount Flinders, Bundamba Creek flows through Ripley Valley into outskirts of the CBD through the suburbs of Swanbank, Blackstone and its namesake Bundamba before finding the Bremer River. In these lower reaches, much of the creek flows on or through council owned parks and reserves which typically consist of dispersed mature trees and riparian corridors which are susceptible to weedy ingress.

High profile sites that were neither well used or highly visual located next to highways were identified as a priority and the removal of weedy mats in between the waterway and the mown grasses areas were tackled initially. These areas were then revegetated using a mixture of native riparian or waterway species known to naturally occur along waterways.

The plants were planted using a combination of contractors and more importantly, community volunteers. As the locations were already popular or visual there was a great deal of interest from schools and catchment groups in the local community. Corporate and community planting days were organised and in 2014 over 6,000 plants were installed by groups such as the Bremer River Fund, Thiess staff, Japanese environmental students and children from Bundamba State High school. One notably successful event was the Trees for Mum day. This concept of planting a tree for, or with, your mum for Mother's Day has continued to grow in popularity. Those taking part regularly return year on year to check 'their' trees and plant more and develop a vested interest in the site and its wellbeing. The site has grown from a single 95m site to over half a kilometre of riparian corridor along George Palmer Park with over 10,000 plants now in the ground.

Description

Maintain flood conveyance capacity

Floodplains are areas of land adjacent to a waterway which stretch from the banks of the waterway channel, to the base of the enclosing valley walls including wetlands and riparian corridors. Floodplains experience periodic inundation when a waterway floods and are an integral part of healthy waterways and flood mitigation. The periodic inundation from the waterway is critical for floodplains so that they can continue to provide a range of important services such as flood mitigation, water quality improvement, habitat and soil replenishment.

Healthy floodplains have the following characteristics:

- longitudinal connectivity along waterways
- lateral connectivity with the waterway
- species diversity of native vegetation, capable of responding to the different frequencies of inundation
- broad, wide and shallow landscapes, often comprising of wetlands.

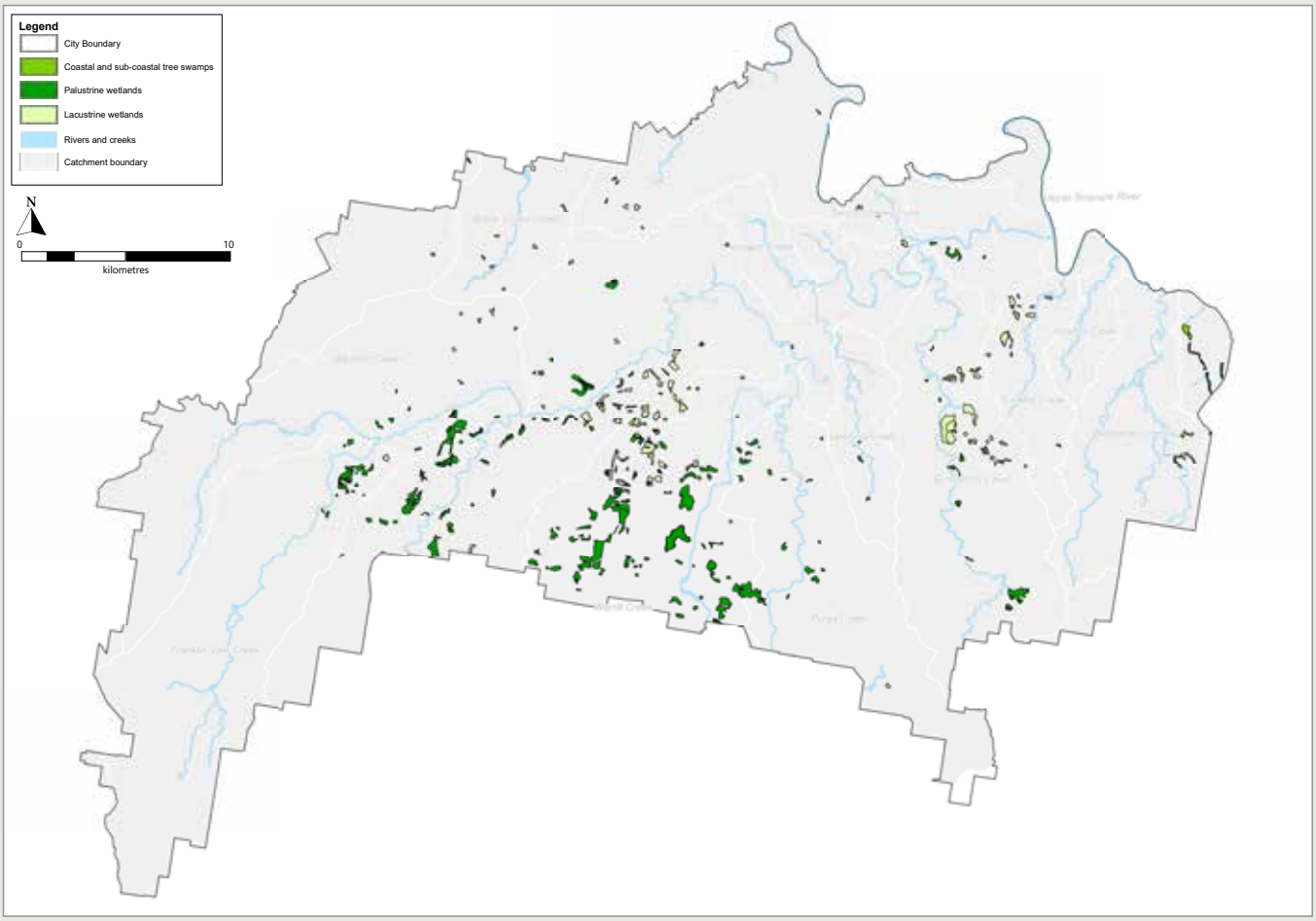
Floodplain wetlands are areas of permanent or intermittent inundation, with water that is static or flowing, fresh, brackish or salt. While a wetland might only be 'wet' for some of the time, it remains defined as a wetland when it is a dry state (DEHP Wetlands). There are approximately 543 lacustrine/palustrine wetlands within the Ipswich City Council LGA (DEHP Wetlands), falling within the floodplains of the region.

The importance of floodplains and wetlands

Healthy and connected floodplains and wetlands provide the following important benefits:

- flood mitigation by slowing, conveying and storing floodwaters
- improved water quality by reducing soil erosion, and capturing and treating pollutants when inundated
- provide important landscape connectivity and habitat for many plants and wildlife (e.g. important fish nurseries)
- sustainable agriculture through productive and fertile soils
- carbon sequestration
- recreation and visual amenity
- recharging of aquifers.

FIGURE 8 – Mapped non-riverine wetlands across Ipswich



Threats to floodplains and wetlands

Many of the natural floodplain features, including wetlands, across Ipswich have been lost or altered due to urban development and agricultural practices.

Floodplain disconnection

Floodplains rely on the periodic inundation of floodwaters and are therefore impacted by activities which alter this connection including:

- piped stormwater flows draining under the floodplain directly into the channel, disconnecting these catchment surface flows from the floodplain area
- change in hydrology associated with creation of levees, dams and weirs
- the deepening of channel beds due to erosion which means that flows no longer regularly inundate the floodplain from the channel.

Removal/filling of wetlands

Many wetlands are ephemeral in nature, meaning that they only hold water after rainfall events and are difficult to identify in extended dry periods. These wetlands can be subject to draining or filling as part of development or agricultural practices.

Management approach

Re-engagement of floodplains

Floodplain management aims to identify floodplain locations where reconnection with the contributing catchment and/or the waterway channel is possible, practical and will provide multiple benefits, including flood mitigation, water quality improvements, habitat, recreation and urban cooling. The approach for floodplain management will depend on what is possible based on the current condition of the floodplain. Ideally, an appropriate floodplain extent will be provided which allows the waterway to move naturally without impacting on infrastructure.

Table 9 provides an overview of the types of floodplain management activities which may be undertaken in different settings.

TABLE 9 – Floodplain management activities in rural and urban areas

Floodplain current condition	Description	Key management driver	Approach
Rural floodplain	Rural floodplains may still contain remnants of floodplain wetlands, but these may no longer be inundated regularly, due to channel incision which has lowered the bed level resulting in the majority of storm flows being conveyed within the channel. The channel erosion and removal of floodplain vegetation in these upstream rural areas also results in flood flows moving more quickly downstream. These could be an opportunity to re-engage the floodplains with the channels in certain locations to provide flood improvement downstream, as well as provide local floodplain functions such as soil improvement and habitat.	Reconnect floodplain with the channel and catchment flows to slow flows and support floodplain wetlands.	Identify locations which will provide local downstream benefits by: ▪ addressing channel erosion and raising the bed level through channel works, to increase the number of floodplain inundation events ▪ increasing the amount of vegetation in the floodplain areas to slow and hold back flood flows which enter the floodplain ▪ working with landholders to ensure there is no loss or compensation for impact on productive land.
Urban floodplain	The majority of urban floodplains have been developed, therefore maintaining flood conveyance and flood immunity within these build-up areas is critical. Raising the bed level and reconnecting the channel with the floodplain often may not be possible. Where this is the case, there could be an opportunity to re-engage the floodplain by intercepting local catchment flows, which form part of the linear open space and stormwater treatment networks.	Reconnect floodplain with catchment subsurface flows to improve water quality.	Identify suitable locations to provide local and downstream improvements by: ▪ increasing pervious areas within the catchment to encourage infiltration of stormwater runoff which will help to reconnect the floodplain to catchment subsurface flows ▪ the use of treatment trains throughout the catchment to help to improve water quality and enhance infiltration of stormwater flows.

Protection of wetlands

Changes in water regime and water quality can have detrimental impacts on wetlands. An understanding of the frequency and timing of inundation is required to ensure that the wetland vegetation can be sustained, especially if there are planned changes to the contributing catchment flows (e.g. increased flow frequency and duration from urban development). While natural wetlands provide water quality treatment, they should be treated as receiving environments, so appropriate pre-treatment of flows is required to maintain the on-going function of the natural wetland.

Current requirements

Ipswich City Council's main land use planning tool for floodplain management (relating to development) is the Ipswich Planning Scheme which strategically governs and guides the city's development. The primary form of regulation is through an Adopted Flood Regulation Line (AFRL) and associated codes and provisions which assist in identifying suitable areas for development, setting development levels and land use outcomes.

In addition to the Planning Scheme, resilient and effective floodplain management is also supported by council's Integrated Water Strategy 2015. Ipswich's future floodplain management will also consider outcomes of the Brisbane River Catchment Flood Study and the Ipswich Integrated Catchment Plan. The latter document includes the consideration of natural floodplain management options and takes a holistic catchment-wide approach to flood management.

Wetland protection, management and responsibility is shared over federal, state and local governments. The Ramsar Convention aims to reduce the loss of wetlands and protect remaining wetlands and at a federal level, the protection of these major wetlands is provided under the *Environment Protection and Biodiversity Conservation Act*. At a state level, the State Planning Policy under the Biodiversity State Interest requires local planning schemes to consider, identify and manage any significant adverse environmental impacts on matters of state environmental significance, which includes wetlands.

Management focus

- Preservation of natural floodplain function by re-instating connections between the floodplain, the channel and/or the catchment and allowing room for water to move
- Identify and protect natural wetlands from changing flow patterns and water quality impacts.

CASE STUDY
EVELYN DODDS CULTURAL RESERVE WETLANDS

Evelyn Dodds Cultural Reserve was once the site of an Aboriginal meeting place, or bora ring. The location was chosen due to its proximity to Bundamba Creek and the waterholes and wetlands present. These wetlands remain to this day set amongst lilies and gum trees within the floodplain of the creek. Small wetlands are ephemerally connected to the creek in hi-flows and are topped up by inflows possibly from ground water. The wetlands are home to many insects and birds including species such as Spoonbills and Egrets as well as turtles and fish. The area also still has a local wallaby population and these animals call this area home despite its proximity to the CBD. The wetlands would have been typical of the floodplain systems found in the flatter lower reaches of many of the Ipswich systems, before the advent of modified conveyance drainage and land use change.

Description

What is community engagement?

Waterways provide a range of services for the community including recreation, water supply and native biodiversity. The community also undertake a range of activities which affect the health of our waterways. Therefore community awareness and long-term engagement is critical to the improvement of waterway health in Ipswich.

The following stakeholders are considered as part of this 'community' in the Waterway Health Strategy:

- landholders – rural, urban and peri-urban
- community groups, sporting groups, schools, educational facilities and alike
- business and industry
- federal, state and local governments
- natural resource management bodies
- development bodies
- Traditional Owners.

The importance of community engagement

Understanding that we all live within a catchment and that our day-to-day activities have the potential to impact on the health of our waterways is an important component of community awareness. The protection and rehabilitation of waterway health cannot be realised without a working partnership between council and the community. To ensure the long-term sustainability of the city's resources and to achieve the vision of 'clean and healthy waterways' it is essential that the community is informed and can be involved in on-ground implementation. This will assist community stakeholders in understanding the ecological, economic and social values of Ipswich waterways.

Threats to community engagement

Key threats to the successful engagement of the Ipswich community in terms of waterway and wetland health improvement include:

- lack of resources available to support community activities
- conflicting or difficult to understand information on waterway and wetland management requirements.

Management approach

Council can help to support community engagement by providing the following:

- accessibility to waterways, pathways, parks and boat ramps
- education about waterway management issues to raise community awareness
- building partnerships to provide institutional arrangements, monetary support and implementation on the skills and expertise of community members.

The type of involvement and engagement will differ for the key community stakeholder groups according to their specific interests, objectives and typical waterway management activities (refer Table 10).

TABLE 10 – Community engagement opportunities across different stakeholder groups

Stakeholder group	Description	Waterway health objectives	Management approach
Landholders – rural and peri-urban	▪ Many Ipswich waterways drain through rural lands which are privately owned ▪ Waterway health is threatened by agricultural runoff, uncontrolled stock access, gully and channel erosion, loss of native vegetation, invasive weed species and water extraction.	▪ Improved land use practices ▪ Increased native riparian vegetation cover and floodplain function.	▪ Knowledge transfer (factsheets, information sessions) ▪ Partnership programs ▪ Monetary assistance to deliver on-ground works.

Stakeholder group	Description	Waterway health objectives	Management approach
Community – urban	▪ Most of the city's population lives within the urban footprint ▪ Waterway health is threatened by domestic impacts of poor urban stormwater quality, clearing for new developments, garden escapees and unmanaged recreational access ▪ Combination of both private and public ownership of riparian land – majority of public land is designed as linear open space.	▪ Improve urban stormwater quality and quantity management ▪ Provide public access and recreational opportunities along urban waterways ▪ Increase the social and environmental values of riparian corridors ▪ Encourage urban landholders to participate in waterway health management initiatives.	▪ Educations (fact sheets, signage) ▪ Creation and support of catchment groups ▪ Community events (e.g. planting days, workshops, competitions) ▪ Provision of safe access to waterway.
Business and industry	▪ Impacts on waterway health from both point and diffuse source pollutants through direct discharge and runoff from impervious surfaces ▪ Most point source discharges are regulated as Environmentally Relevant Activities (ERA's) under the *Environmental Protection Act 1994*.	▪ Reduce the impact of point and diffuse source pollutants ▪ Improve the public image of businesses and industries working towards Ipswich as a liveable city with 'clean and health waterways'.	▪ Education (fact sheets, information sessions) ▪ Partnerships ▪ Consistent approach to compliance regulation.
Federal, state and local governments	▪ Many urban waterways lie within or adjacent to public open space which is owned and/or managed by local governments ▪ Ipswich City Council has many departments which work within waterway corridors ▪ Waterways in Ipswich flow through multiple council jurisdictions (e.g. Lockyer, Scenic Rim and Brisbane council areas) ▪ State government produce the legislation and guidance for the overall protection of QLD waterways.	▪ Ensure waterways are protected in a consistent manner to provide multiple benefits for the environment and community.	▪ Knowledge transfer/advice ▪ Holistic waterways planning studies ▪ Coordinated enforcement (joint investigations) ▪ Monitoring.
NRM bodies	▪ Independent, not-for-profit organisations which have a focus on improving the condition of land and waterways in South-East Queensland (e.g. Health Land and Water, Landcare groups, etc) ▪ Provide range of activities including monitoring, educational materials, community education and on-ground works.	▪ Bringing together industry, research, government and the community in the improvement of waterway and wetland health.	▪ Knowledge transfer/education ▪ Monitoring ▪ Regional committees/ advisory groups ▪ Joint planning and delivery of on-ground works.
Traditional Owners	▪ Traditional Owners have a strong spiritual connection and long history with waterways across Ipswich ▪ Waterways were used for food, materials, living and celebrations and there are many registered sites of Aboriginal cultural significance.	▪ Engage with the Traditional Owners to gain an understanding of the history of Ipswich waterways and requirements for their ongoing management ▪ Recognise sites of Aboriginal cultural significance.	▪ Engagement through Native Title and Cultural Heritage Officer.

Stakeholder group	Description	Waterway health objectives	Management approach
Development bodies	▪ Rapidly expanding urban development including greenfield and infill projects ▪ Impacts on waterway health associated with large areas of exposed soil during the construction phase of development, followed by increased areas of impervious surfaces.	▪ Reduce the impacts of soil disturbance and sediment movement from new development sites ▪ Contain, control and manage urban stormwater quality and quantity as close to the source as possible.	▪ Legislative requirements and supporting guidance material ▪ Consistent approach to development assessments.

Current requirements

Council have a range of current activities which support the community in improving waterway and wetland health across Ipswich, including:

- development of publically accessible educational materials and waterway planning documents
- supporting on-ground works through partnership programs such as voluntary conservation agreements (which includes agreement and partnerships focused on improving waterway health), community planting days
- provision of clear requirements and advice for waterway management, in the planning and design of urban development
- involvement in regional advisory groups
- planning and design of linear open spaces, which provide for community and environmental outcomes.

Management focus

- Holistic planning of waterway health outcomes with relevant stakeholders
- Support community and external stakeholders to be able to deliver on-ground works
- Provide a clear point of contact for waterway health activities within council.
- Provide safe points of access and recreation in waterway corridors.

CASE STUDY
UPPER BLACK SNAKE CREEK IMPROVEMENT PLAN

Ipswich City Council works closely with the communities and professional stakeholders to deliver social and economic outcomes.

The Upper Black Snake Creek Improvement Plan was developed and delivered in partnership with a reference group representing a cross section of the community including the local school, land owners, the Marburg Show Society and the local Landcare group, West Moreton Landcare.

Through a number of workshops, door knocking activities and follow up steering meeting, the plan pieced together local knowledge and academic reports, as well as models and data to identify the major challenges and signpost some directions towards integrated solutions.

Since completion, the plan has led to the following outcomes:

- the securing of funds for a community pathway alongside the creek with corresponding native revegetation
- the production of the "Living in Black Snake Creek" booklet for the residents of the catchment in partnership with West Moreton Landcare and Healthy Land and Water
- clearing and reshaping of the creek channel upstream of the highway bridge
- stabilisation of the creek floodway with rock and revegetation downstream of the detention basin
- securing of funding from the SEQ Council of Mayors through the Resilient Rivers Initiative for targeted revegetation of the midslopes, to assist with flood resilience and salinity to be delivered alongside private landholders
- several landholder workshops focusing on salinity and paddock/grazing management with the local community.

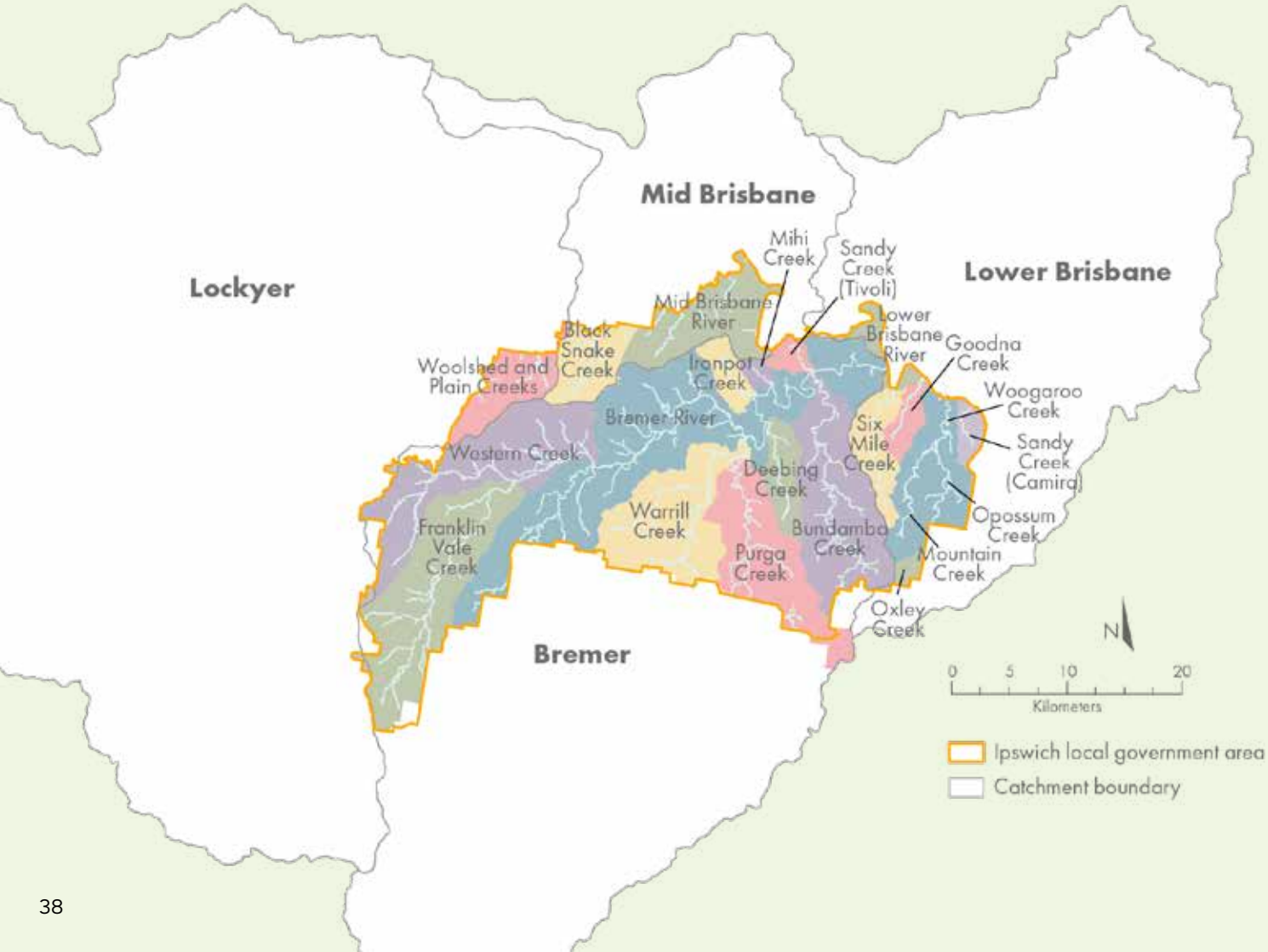
Work continues in the catchment and does so with the support and assistance of the local community.

D. SUB-CATCHMENT SUMMARIES – CURRENT CONDITION

Figure 9 presents the many waterway sub-catchments within the Ipswich City Council LGA including those within the Bremer River catchment and sections of the Lockyer Creek, Mid Brisbane and Lower Brisbane River catchments.

This section of the Waterway Health Strategy Background Report presents a summary of the current condition of these sub-catchments. Refer to the Waterway Health Strategy 2020 for information on targeted actions for each sub-catchment.

FIGURE 9 – Catchments and sub-catchments within the Ipswich City Council boundary



BREMER RIVER CATCHMENT

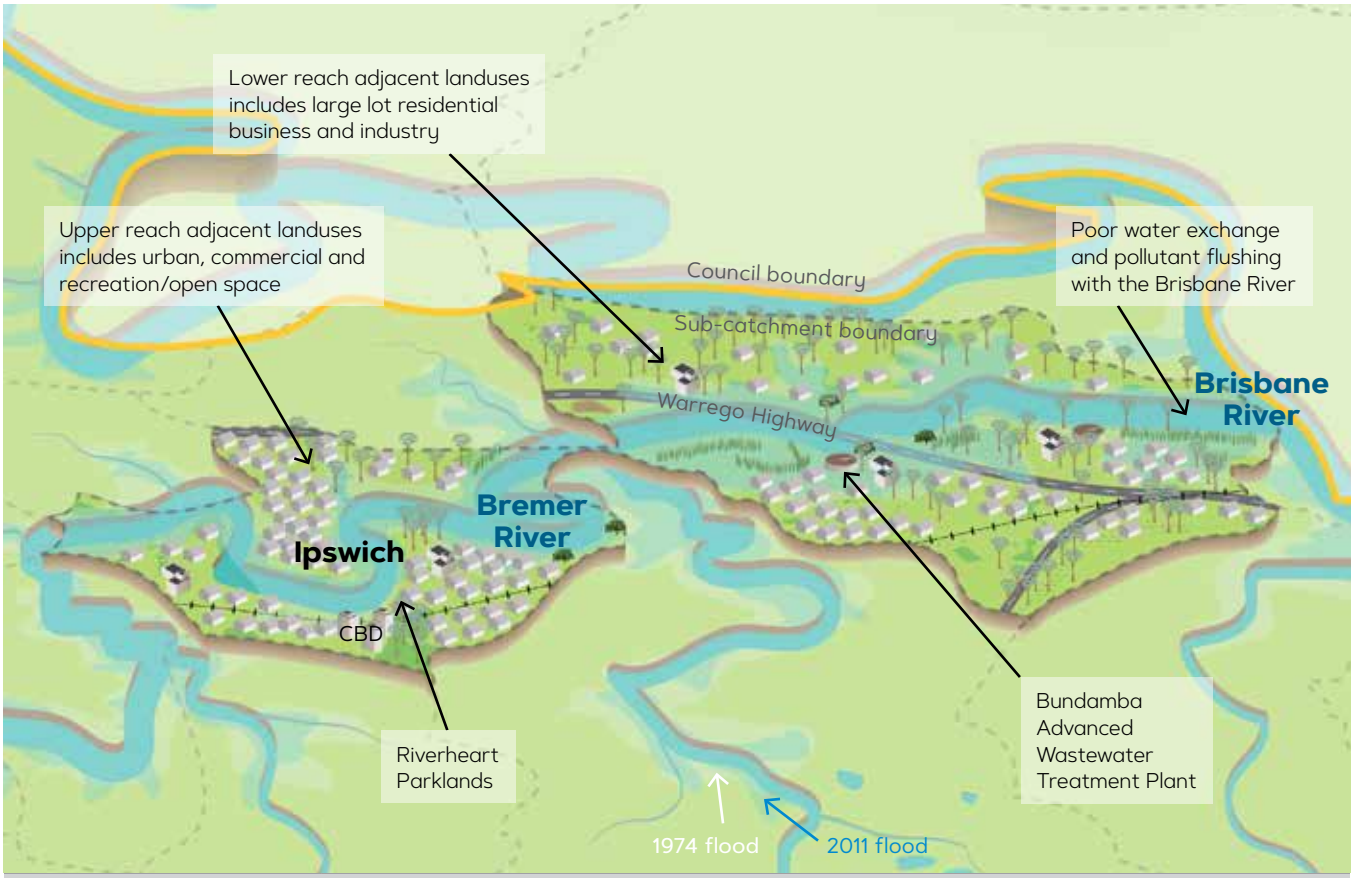
The Bremer River Catchment covers a total area of 2028km^2 and flows through the Scenic Rim and Ipswich local government areas. It is comprised of the following sub-catchments:

- Bremer River (estuary)
- Bremer River (freshwater)
- Bundamba Creek
- Deebing Creek
- Franklin Vale Creek
- Iron Pot Creek
- Mihi Creek
- Sandy Creek (Tivoli)
- Purga Creek
- Warrill Creek
- Western Creek.

FIGURE 10 – Bremer River Catchment and Sub-Catchments

BREMER RIVER (ESTUARY)

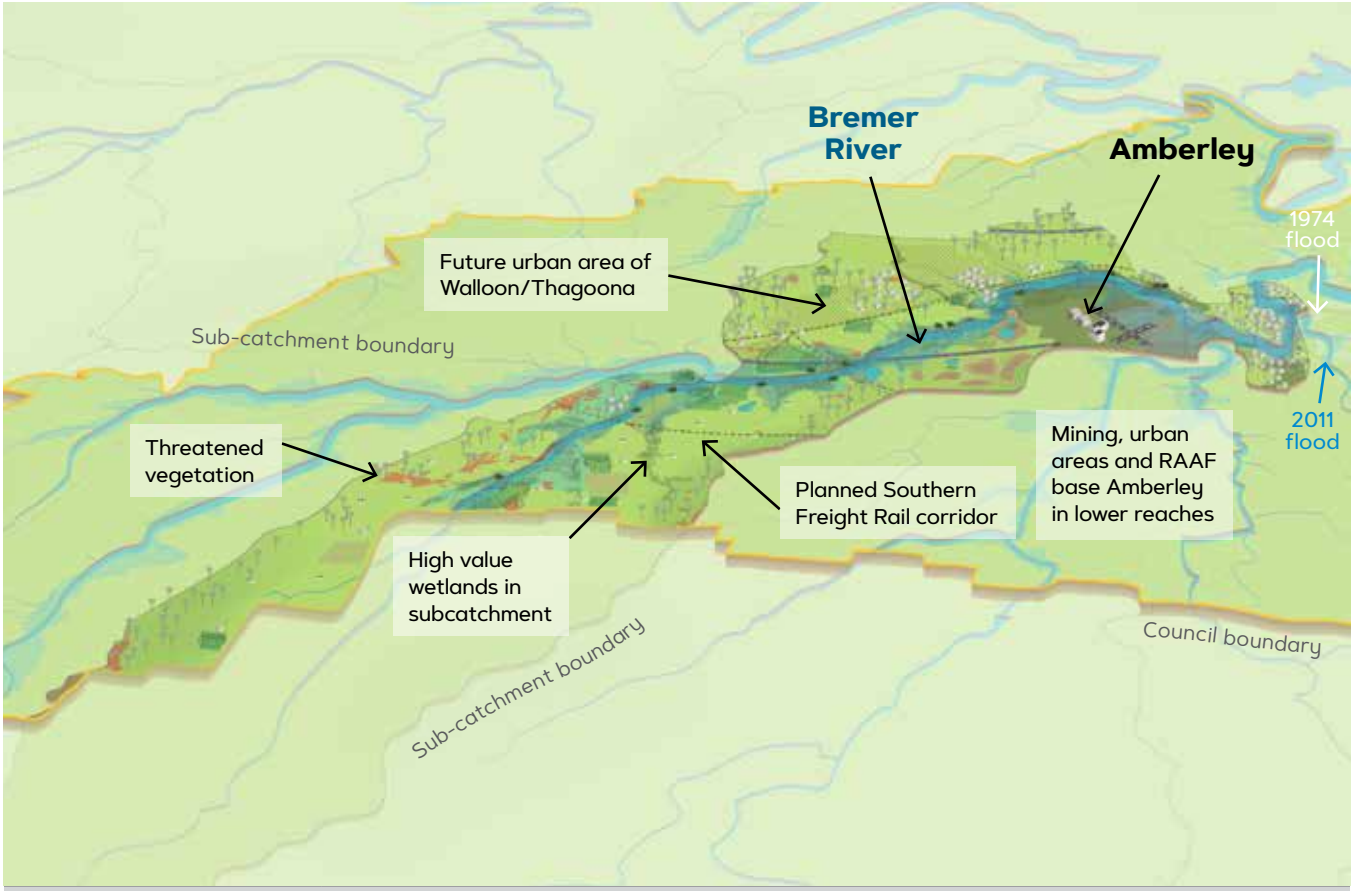
The Bremer River is a major tributary of Brisbane River, whose confluence is to the east of Ipswich.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Channel form is variable with major instabilities in the CBD area ▪ Limited aquatic habitat provided and native and introduced fish species identified in fish surveys ▪ Poor water quality due to very low levels of compliance with water quality objectives ▪ Wastewater treatment plants including at Bundamba have licenced discharge points directly into the Bremer River ▪ Tidal influences from the Brisbane River reach about 19km upstream.
Riparian	▪ Variable riparian condition due to a range of vegetation widths, however longitudinal connectivity is generally maintained.
Floodplain	▪ Consists of a mix of land uses including urban, industrial, commercial, parks and sports grounds and bushland ▪ Wetlands mapped in this catchment have been heavily impacted.
Community	▪ Accessible to the community with about 6.8km adjacent to public parks and reserves ▪ The Bremer Catchment Association and Ipswich Rivers Improvement Trust have undertaken works in the past ▪ There are a number of voluntary environmental agreements with private landholders.

BREMER RIVER (FRESHWATER)

The freshwater sub-catchment arises in the Main Range National Park (World Heritage Area) and enters the Bremer River estuarine section at West Ipswich.



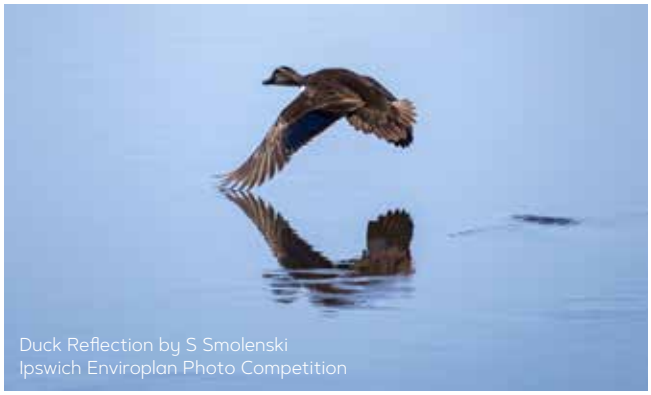
MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Channel form is generally stable with areas that have been impacted by cattle ▪ Moderate aquatic habitat with native and introduced fish species identified in fish surveys ▪ Good water quality condition ▪ Waterway contains pools connected by meandering channels. During extended dry periods, connectivity is reduced within the channel with the formation of isolated pools.
Riparian	▪ Variable riparian condition with many areas having been cleared in the past and a presence of weeds.
Floodplain	▪ Floodplain mostly cleared for grazing and agriculture ▪ Palustrine wetlands present providing important habitat and water quality improvements ▪ Significant water resource development including farm dams and mining voids reducing floodplain connectivity.
Community	▪ Majority of the waterway is adjacent to private land ▪ A number of voluntary conservation agreements in the lower section of the catchment ▪ The Bremer Catchment Association and Ipswich Rivers Improvement Trust have undertaken works in the past.

BUNDAMBA CREEK

The sub-catchment covers a total area of 114km² and arises in the Flinders-Goolman Conservation Estate, flowing into the Bremer River estuary.

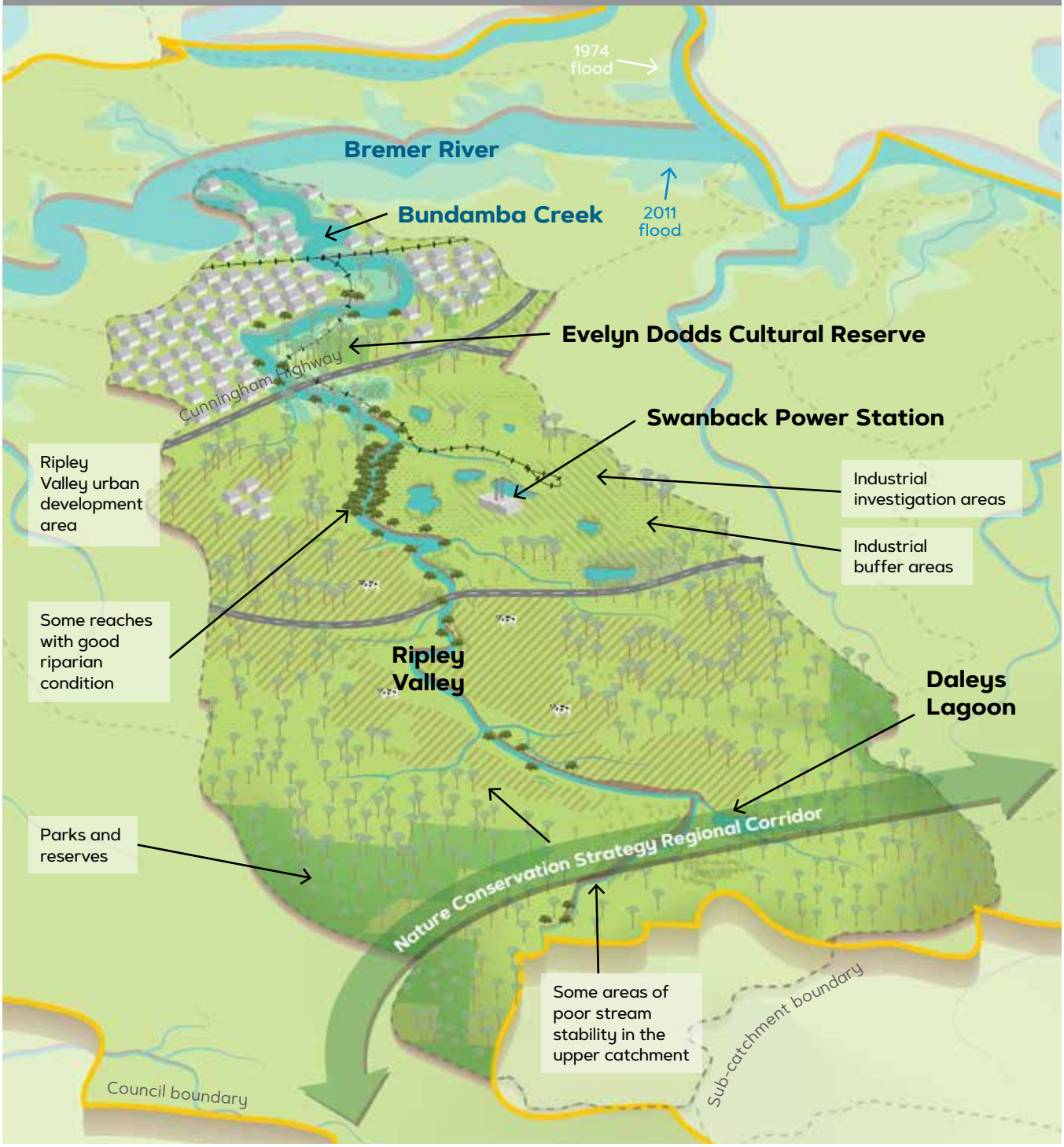
MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Sections flow over bedrock which controls bed incision and provides diversity of pool, run and riffle habitats ▪ Channel form varies with some degradation present and areas of erosive soils place waterway at high risk ▪ Platypus detected in creek. Fish surveys identified both native and introduced fish species ▪ Good aquatic habitat and water quality condition.
Riparian	▪ Variable riparian condition with bushland present in the upper catchment ▪ Riparian weed species identified across the corridor.
Floodplain	▪ Much of the floodplain has been cleared previously for grazing with extensive urban development planned ▪ Wetland systems identified including Daly's (Bundamba) Lagoon ▪ Significant water resource development including farm dams and mining voids reducing floodplain connectivity.
Community	▪ Evelyn Dodds Cultural Reserve is an important cultural site for local Indigenous peoples ▪ Currently a mix of private and public land with corridor planned to be a major linear open space in the future ▪ A number of voluntary conservation agreements, especially in the upper catchment ▪ The community has been active in creating a plan for the corridor and delivering on-ground works, including revegetation and weed management activities.

Darter Sun Bathing by L Hardwick
Ipswich Enviroplan Photo Competition



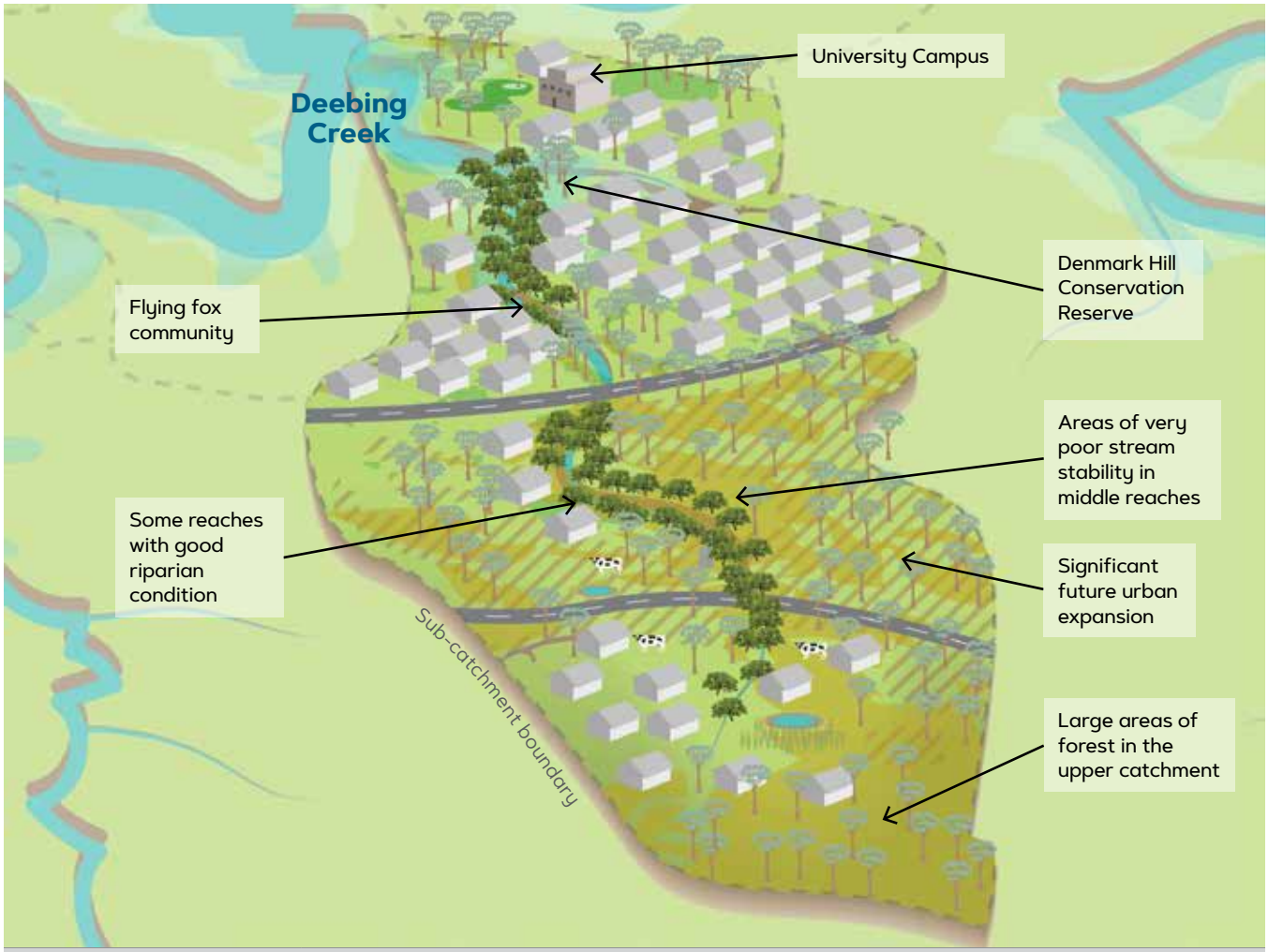
Duck Reflection by S Smolenski
Ipswich Enviroplan Photo Competition

BUNDAMBA CREEK



DEEBING CREEK

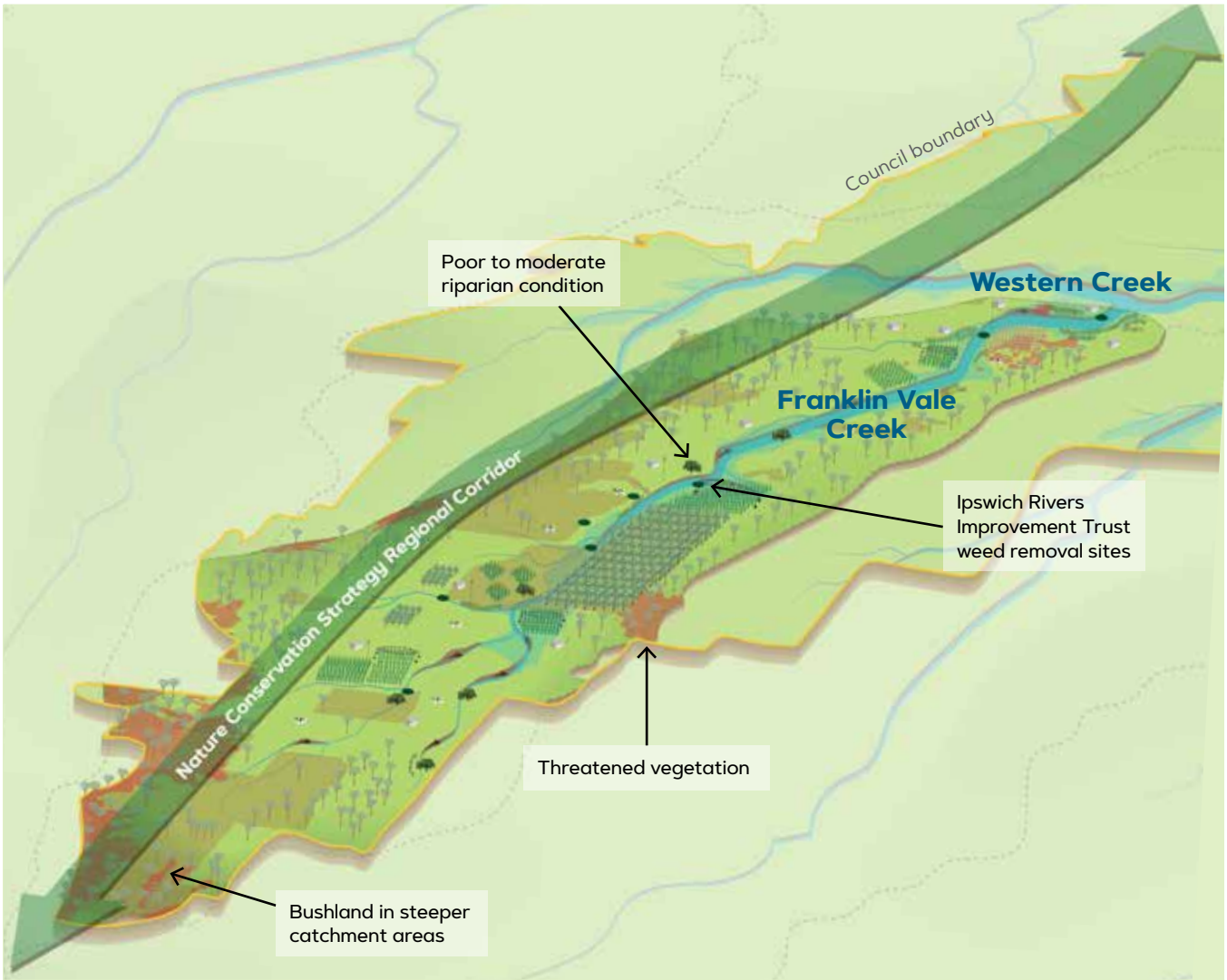
The sub-catchment headwaters arise in the Grampian Hills and flow into the freshwater section of the Bremer River, near One Mile Bridge in West Ipswich.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Channel form is predominately natural although some concrete sections in urban area ▪ Some major erosion issues in the upper catchment area ▪ Major sand slug is completely infilling the channel about 2km downstream of Centenary Highway ▪ Moderate aquatic habitat provided due to good riparian vegetation cover in most areas.
Riparian	▪ Variable riparian condition with a significant proportion in good condition.
Floodplain	▪ About half the floodplain is currently identified as bushland with the remaining floodplain containing grazing land, historic residential development, parks, golf courses and sports grounds ▪ The area faces significant changes as part of the Ripley Valley urban development.
Community	▪ Connected to the important Indigenous cultural heritage site of Deebing Creek Mission and cemetery ▪ Currently a mix of private and public land with corridor planned to be a major linear open space and active transport corridor in the future.

FRANKLIN VALE CREEK

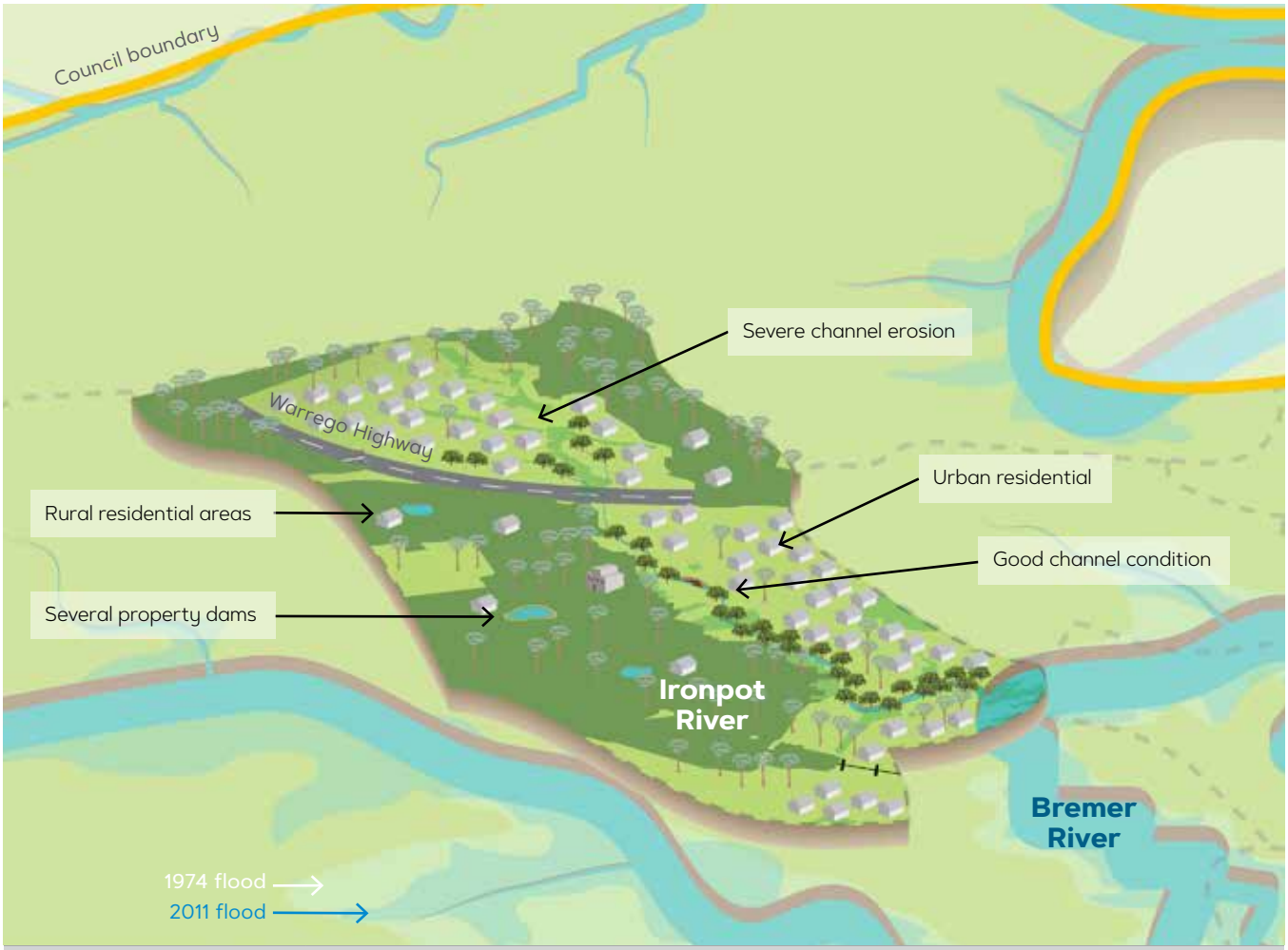
The Franklin Vale Creek sub-catchment flows northeast to enter Western Creek at Calvert. About 90 per cent of the catchment is within Ipswich LGA.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Single continuous channel with anabranching sections ▪ Channel form degraded with minor instabilities in lower reaches ▪ Erosion resulting in significant sediment sources within the Bremer Catchment.
Riparian	▪ Poor to moderate riparian condition along the creek with some sections devoid of riparian vegetation ▪ Creek instabilities due to removal of vegetation and stock access.
Floodplain	▪ Majority of floodplain cleared for grazing, crops and pasture and is zoned Agricultural Land Classification – Class A and B ▪ Wetlands are present, most of which are in good condition ▪ Farm dams are also present throughout catchment.
Community	▪ Registered Indigenous cultural heritage sites present throughout the sub-catchment ▪ Creek adjacent to privately owned land ▪ Large number of landholders have voluntary conservation agreements with council.

IRON POT CREEK

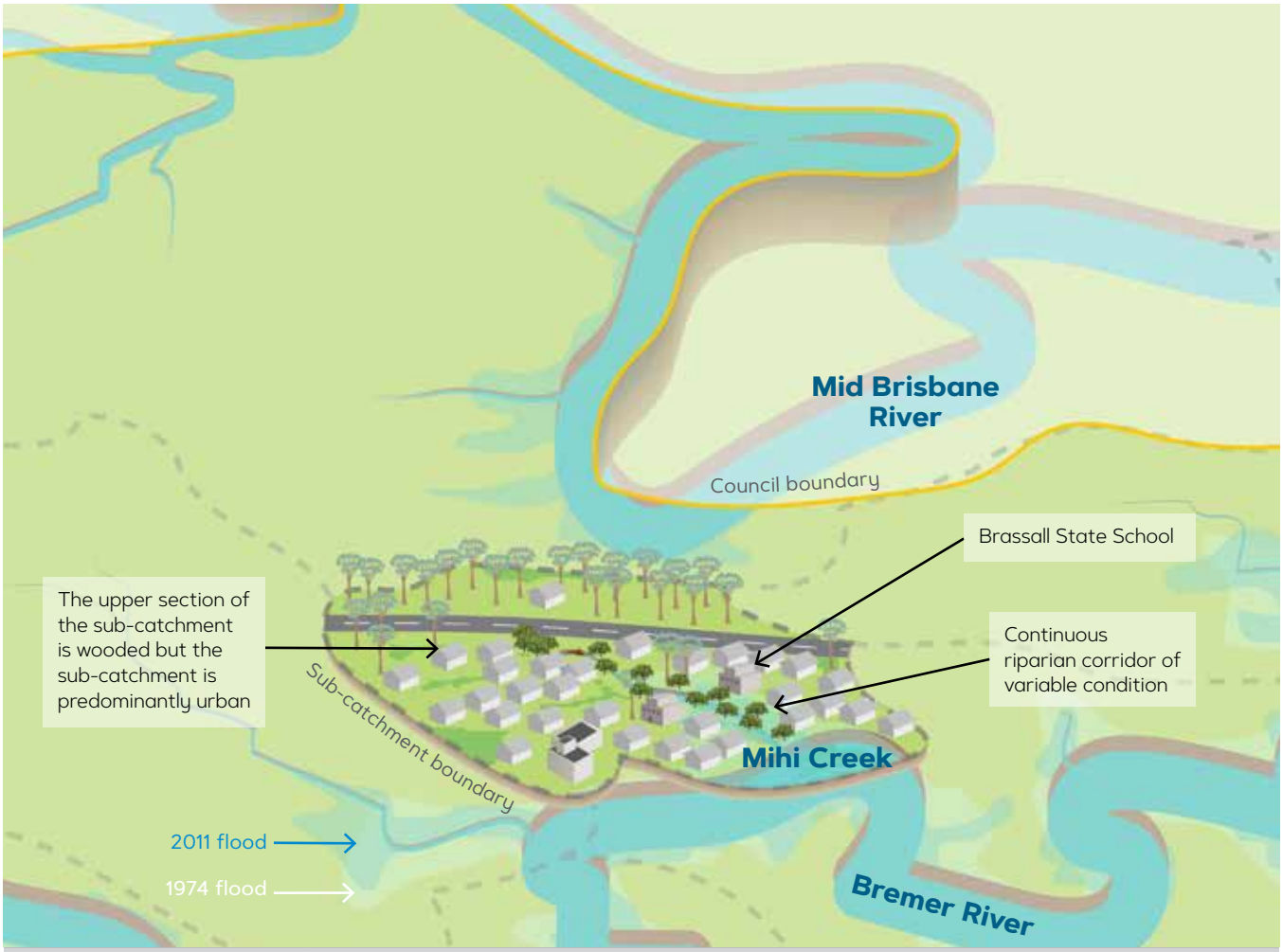
Iron Pot Creek is a tributary of the Bremer River and is a small 16.7km² largely urbanised sub-catchment that flows through Blacksoil, Brassall, Karrabin, Pine Mountain and Wulkuraka.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Variable channel form with extensive erosion in the upper reaches and more stable channel conditions downstream with chains of ponds sections ▪ Active incision still occurring in upper reaches which is lowering the bed level and resulting in steep, unstable banks ▪ Good aquatic habitat present in some locations ▪ No water quality, invertebrate or fish data available.
Riparian	▪ Predominately in good condition providing a good buffer and longitudinal connectivity ▪ Number of studies and works carried out including erosion and riparian works in upper reaches and weed management in lower reaches.
Floodplain	▪ Predominately bushland with some cleared for urban, parks, sports grounds and grazing lands.
Community	▪ About 4.5km of total 9.9km length is next to public parks and reserves, allowing community access to creek.

MIHI CREEK

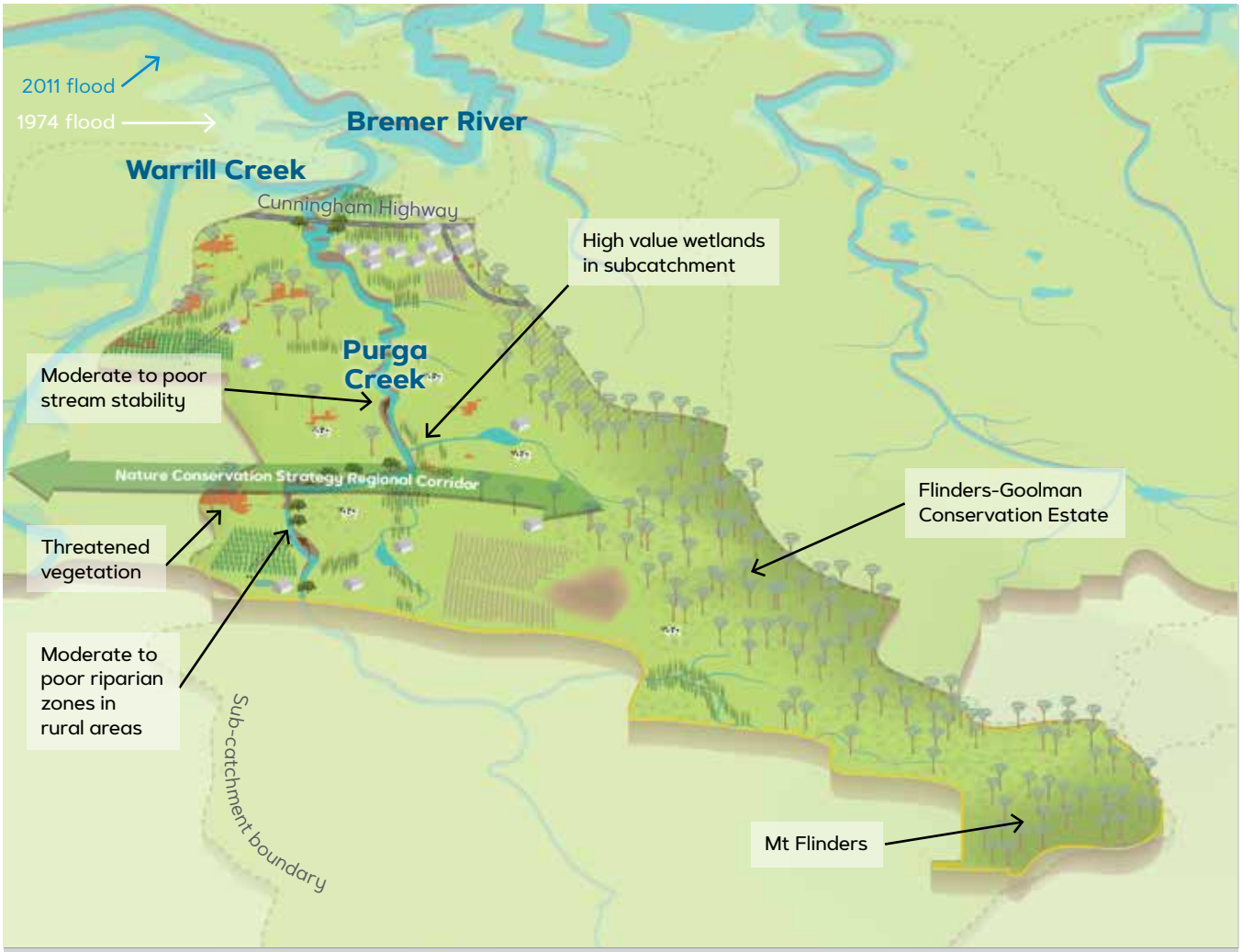
The Mihi sub-catchment is 5.9km² in area and drains the ridgeline which separates the Bremer and Brisbane River catchments, and flows into the estuarine section of the Bremer River.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Variable stream condition with a mix of natural and constructed channel forms ▪ Severe gully erosion in upper catchment ▪ Moderate aquatic habitat present ▪ No water quality, invertebrate or fish data available.
Riparian	▪ Moderate riparian condition overall with good riparian condition in the upper reaches ▪ The urban riparian zone provides good longitudinal connectivity but of limited width and dominated by weeds.
Floodplain	▪ The floodplain is a mix of urban, parks and bushland.
Community	▪ Anecdotal evidence suggests that Aboriginal Corroboree were held on the site that is currently Ipswich State High School ▪ About 2.3km of the total 3.36km length of the creek is adjacent to public parks and reserves ▪ Number of environmental partnerships that enable community-driven improvement and ownership of the waterway.

PURGA CREEK

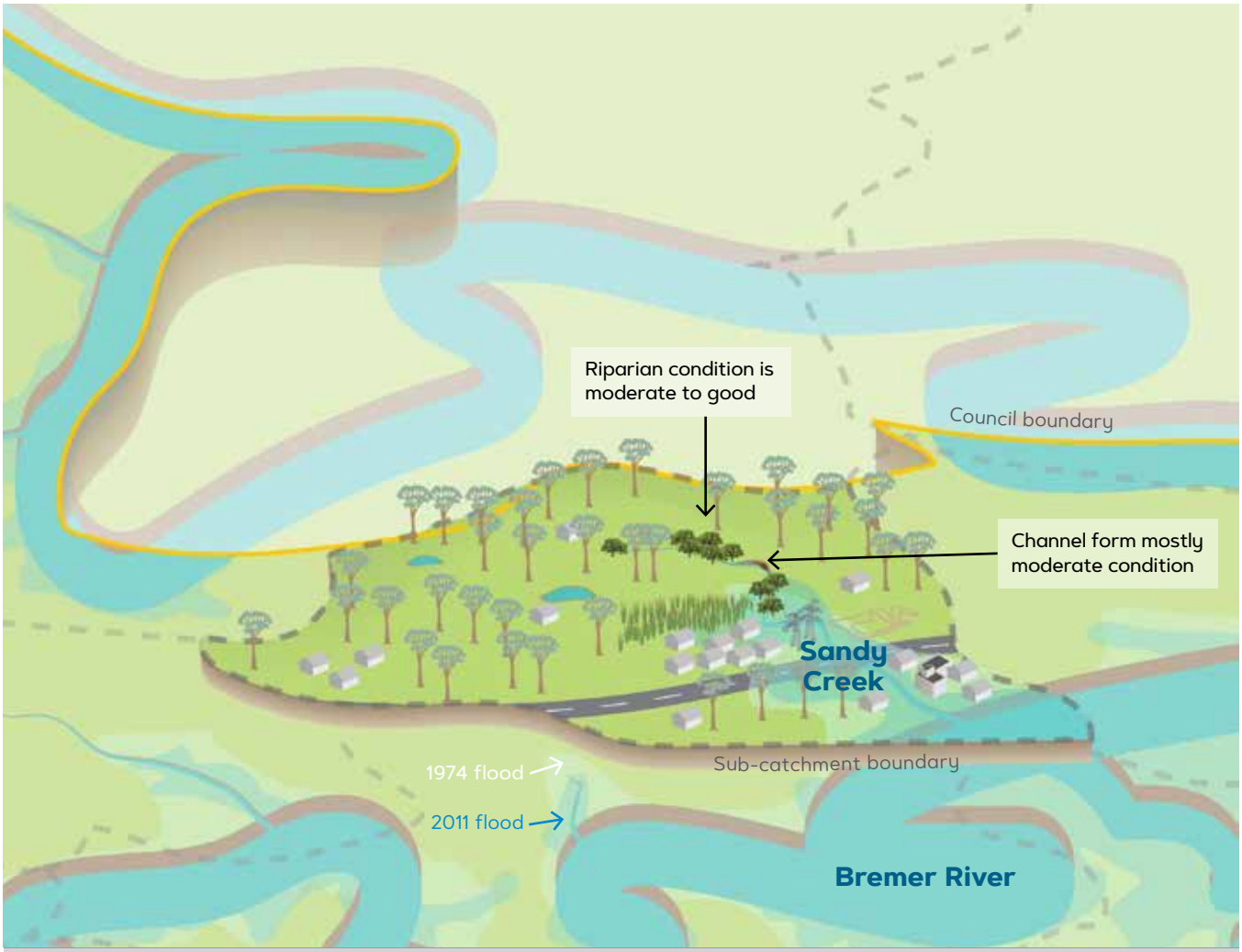
Purga Creek is a major tributary of Warrill Creek, joining the waterway approximately 3km upstream of the Bremer River and Warrill Creek confluence. The sub-catchment has a total area of 227km², about half of which is within the Ipswich LGA.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Moderate channel form overall with degradation present due to lack of riparian vegetation ▪ Minor instabilities observed ▪ Moderate aquatic habitat with good water quality ▪ Native and introduced fish species identified in fish surveys.
Riparian	▪ Poor riparian condition due to lack of vegetation and presence of weeds.
Floodplain	▪ The majority of the floodplain has been cleared with mostly irrigated horticulture on the floodplains and grazing on the hillslopes ▪ Remaining floodplain area has been identified as bushland, some of which is within Flinders-Goolman Conservation Estate and Purga Nature Reserve ▪ There are mapped wetlands within the floodplain identified as in good condition.
Community	▪ Majority of the waterway channel drains through privately owned land ▪ Important Indigenous cultural heritage sites mapped in the sub-catchment.

SANDY CREEK (TIVOLI)

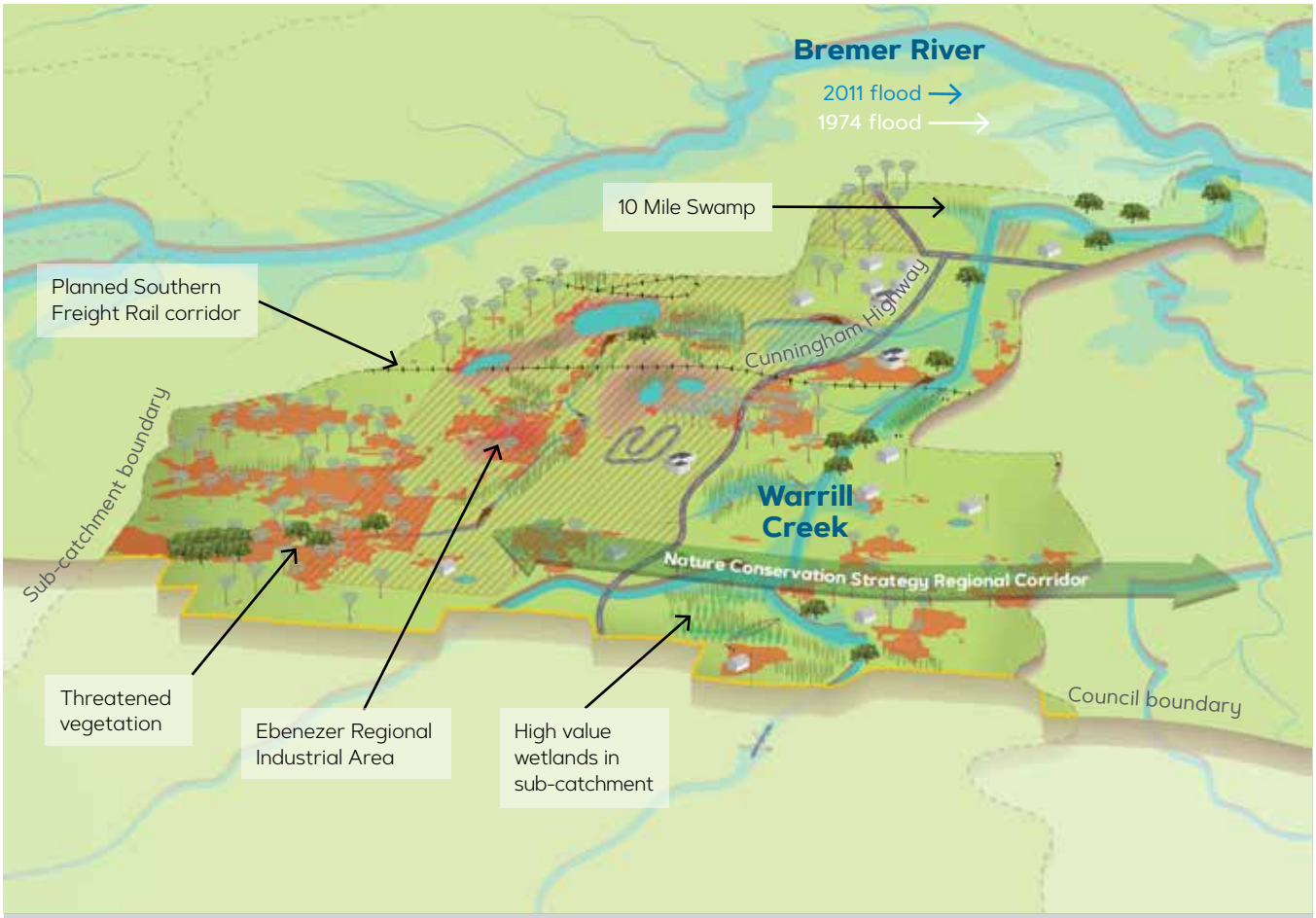
The sub-catchment covers an area of 8.7km² and flows from the ridge line which separates the Bremer and Brisbane River catchments, through the suburbs of Chuwar, Tivoli and North Tivoli into the Bremer River estuarine zone, 8km upstream of the Brisbane River confluence.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Waterway consists of both continuous and discontinuous sections of channel, which are all generally stable ▪ Aquatic habitat is in moderate condition, with no water quality, macroinvertebrate or fish data available.
Riparian	▪ Variable riparian conditions due to some impacts from land uses and presence of weeds.
Floodplain	▪ Floodplain consists of mainly bushland with the remaining areas being urban and cleared grasslands ▪ A number of water storages identified in the sub-catchment.
Community	▪ No community access to waterway.

WARRILL CREEK

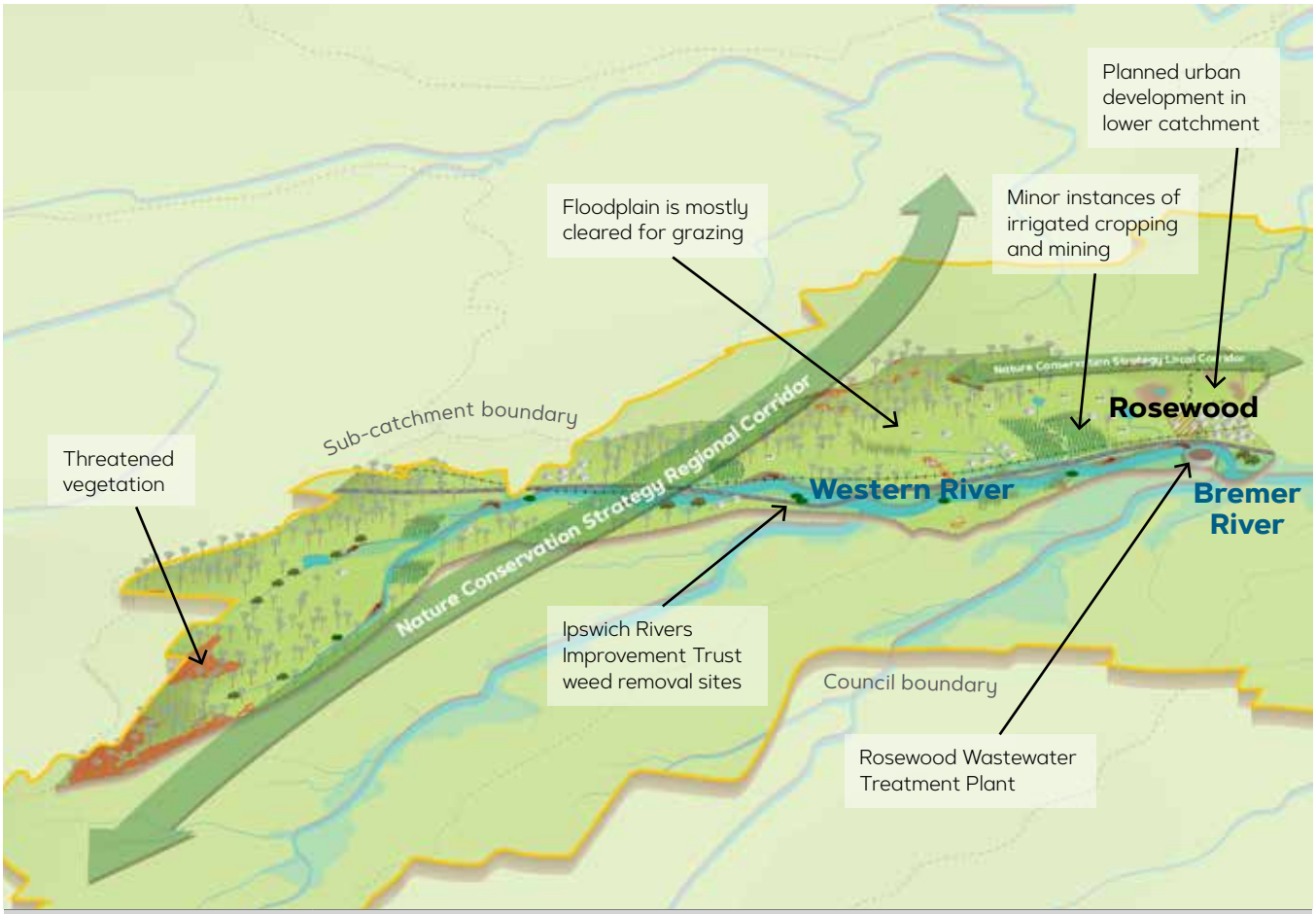
Warrill Creek rises in the Main Range National Park (World Heritage Area) and flows about 70km down to its confluence with the Bremer River near Amberley. Only the lower reaches are within the Ipswich LGA.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Transitions between single continuous channel and anabranching low flow channels within a wide floodplain valley ▪ Channel bed and banks are generally stable with some localised degradation ▪ Channel erosion outside of Ipswich LGA is generating high sediment loads which may impact pools ▪ Moderate aquatic habitat with native fish species identified in fish surveys.
Riparian	▪ Variable riparian condition with moderate condition riparian corridor in Warrill Creek with some clearing and weeds ▪ Poor condition riparian corridor in Ebenezer Creek as there is limited extent of riparian vegetation due to previous mining.
Floodplain	▪ Floodplain mostly cleared for grazing and agriculture ▪ Remaining floodplain areas identified as bushland but negligible amount within Ipswich. ▪ Significant water resource development including Moogerah Dam, weirs, farm dams and mining voids reducing floodplain connectivity and impact stream flow regimes and fish movements ▪ Mapped high value wetlands.
Community	▪ Majority of waterway is adjacent to private land ▪ A number of voluntary environmental agreements across the catchment.

WESTERN CREEK

Western Creek sub-catchment headwaters arise in the Little Liverpool Range and it includes the townships of Rosewood, Calvert and Grandchester.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Minor instabilities present with cattle observed to be impacting on bank stability ▪ Moderate aquatic habitat supporting native fish species ▪ Good macroinvertebrate and water quality results ▪ Rosewood Wastewater Treatment Plant discharges to Western Creek via a series of lagoons and constructed wetlands.
Riparian	▪ Poor to moderate riparian condition with the exception of the headwaters within bushland which is in good condition ▪ Vegetation in the remaining areas has been impacted by agricultural land uses but longitudinal connectivity has been maintained.
Floodplain	▪ Majority of floodplain cleared for grazing, crops and pasture with remainder identified as bushland ▪ Water storages including farm dams and mapped wetlands.
Community	▪ Registered Indigenous cultural heritage sites, predominately in floodplains ▪ Creek adjacent to privately owned land ▪ Large number of voluntary conservation agreements with council.

MID BRISBANE RIVER CATCHMENT

The Mid Brisbane River Catchment covers a total area of 552km^2 and is the primary drinking water catchment for South-East Queensland, providing water for most of Brisbane and Ipswich. It is also a key water resource for irrigation, stock grazing, passive recreational use and ecological function.

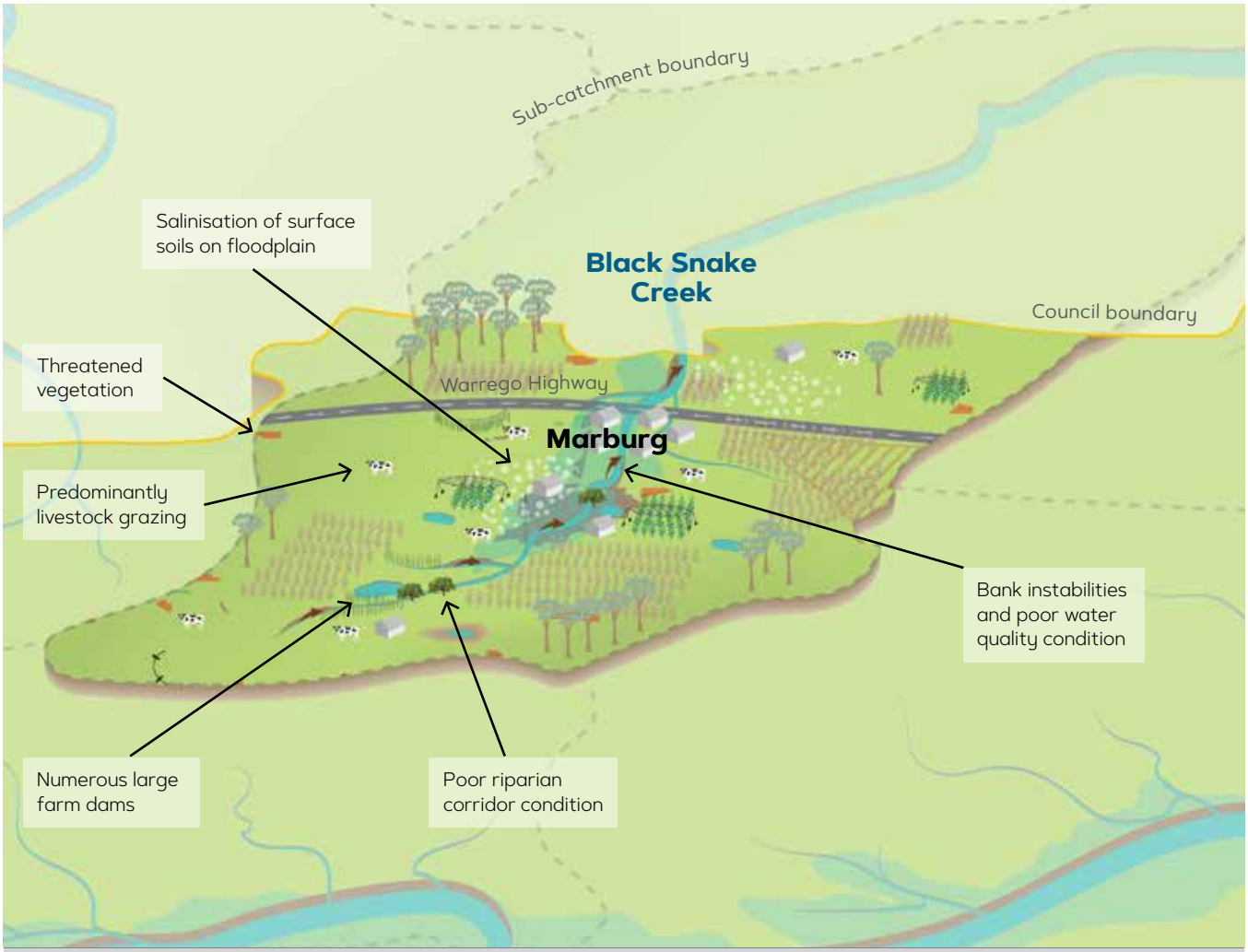
The Mid Brisbane River comprises the following sub-catchments within the Ipswich LGA boundary:

- Black Snake Creek
- Mid Brisbane River.

FIGURE 11 – Mid Brisbane River Catchment and Sub-Catchments

BLACK SNAKE CREEK

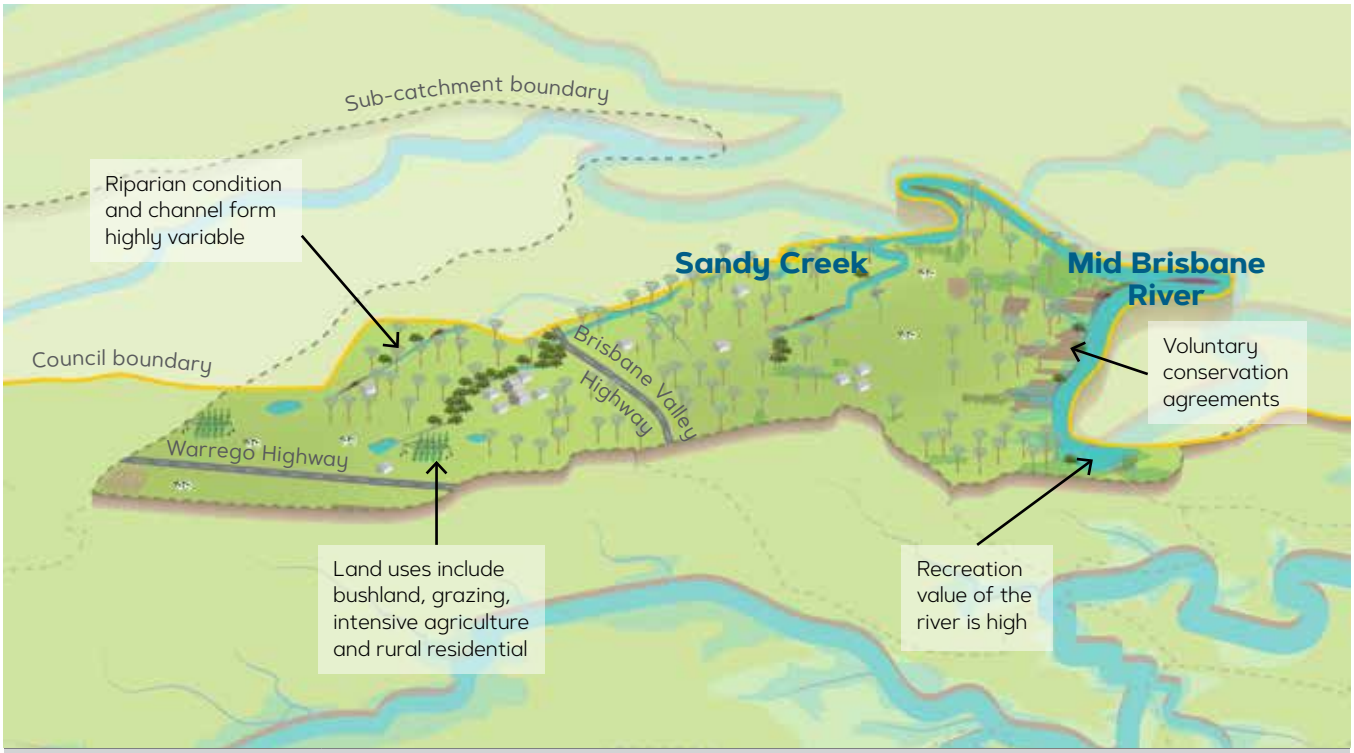
About 35km² of the the sub-catchment is within the Ipswich LGA. The creek drains the northern slopes of the rolling hills which separate the Bremer and Brisbane River catchments, and enters the Brisbane River between Wivenhoe Dam and Mt Crosby Weir.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Channel form is highly modified and degraded and a continuous channel along much of its length due to historic channel incision ▪ Widespread bed and bank erosion ▪ Little aquatic habitat present ▪ Water quality is poor with salinity and microbiological as the two key water quality issues.
Riparian	▪ Consistently poor riparian habitat and vegetation corridor across the catchment.
Floodplain	▪ Extensive clearing of the floodplain for grazing, crops and pasture ▪ Significant flooding experienced and many water resource developments including farm dams and flood retention basins.
Community	▪ Mostly private land with only a small section of the creek adjacent to public land ▪ Number of properties with voluntary environmental agreements with council ▪ West Moreton Landcare has completed various projects within the sub-catchment.

MID BRISBANE RIVER

The sub-catchment covers an area of 63km² within the Ipswich LGA out of a total sub-catchment area of 454km², and includes Sandy Creek (Pine Mountain) and Watercress Creek. It is upstream of Mt Crosby Water treatment plant offtake.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Variable channel form with some significant degradation in some areas ▪ Moderate water quality but good presence of native fish and macroinvertebrates ▪ Platypus sighted with evidence of healthy and breeding population.
Riparian	▪ Generally poor riparian condition and connectivity along the main channels.
Floodplain	▪ Floodplain predominately grassland and bushland with small area of urban development ▪ Wivenhoe Dam and Somerset Dam have significantly altered flow regimes, with flow variability reduced.
Community	▪ Number of public parks and reserve adjacent to the waterway ▪ Number of voluntary conservation agreements with private landholders.

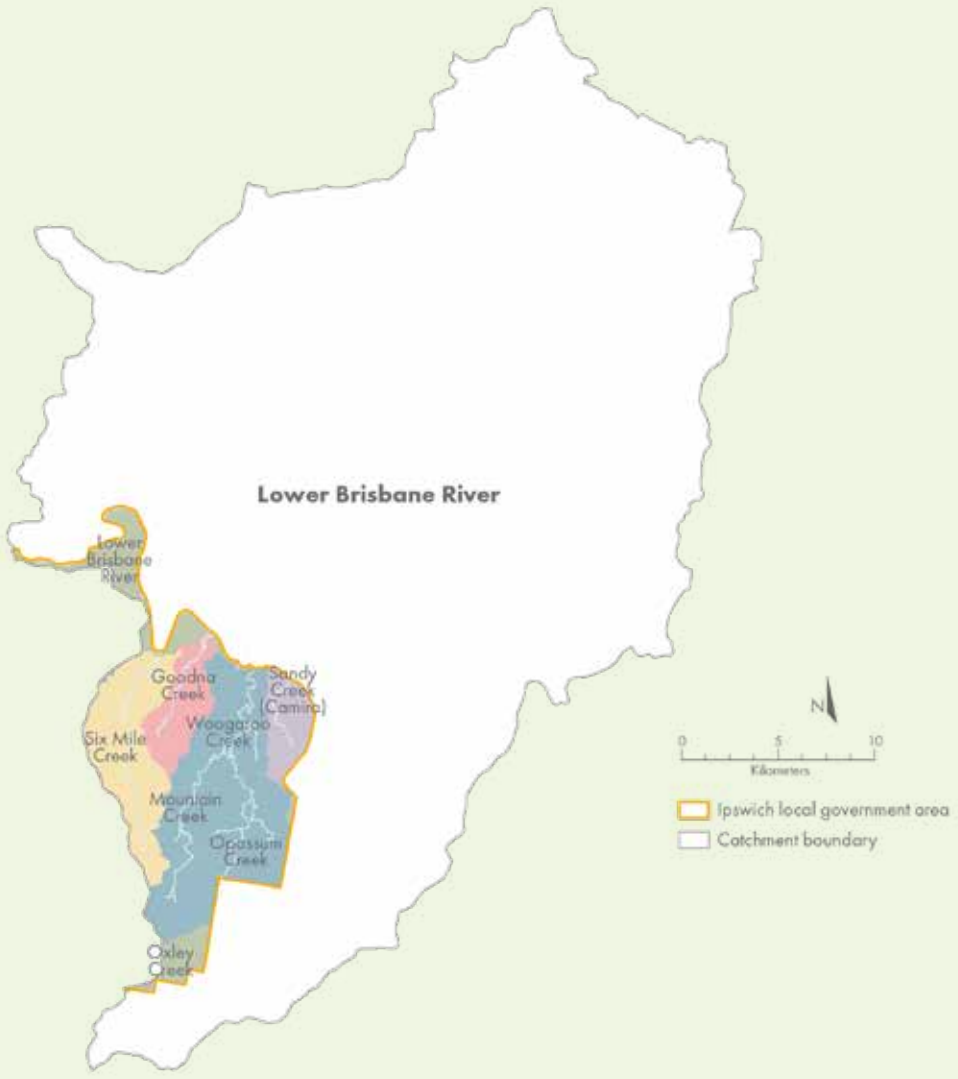
LOWER BRISBANE RIVER CATCHMENT

The Lower Brisbane River Catchment covers a total area of 1,195km^2 and is a highly urbanised catchment with sections of the river used regularly for passive and active recreational use, including jet boating, water skiing and fishing.

It is comprised of the following sub-catchments within the Ipswich LGA:

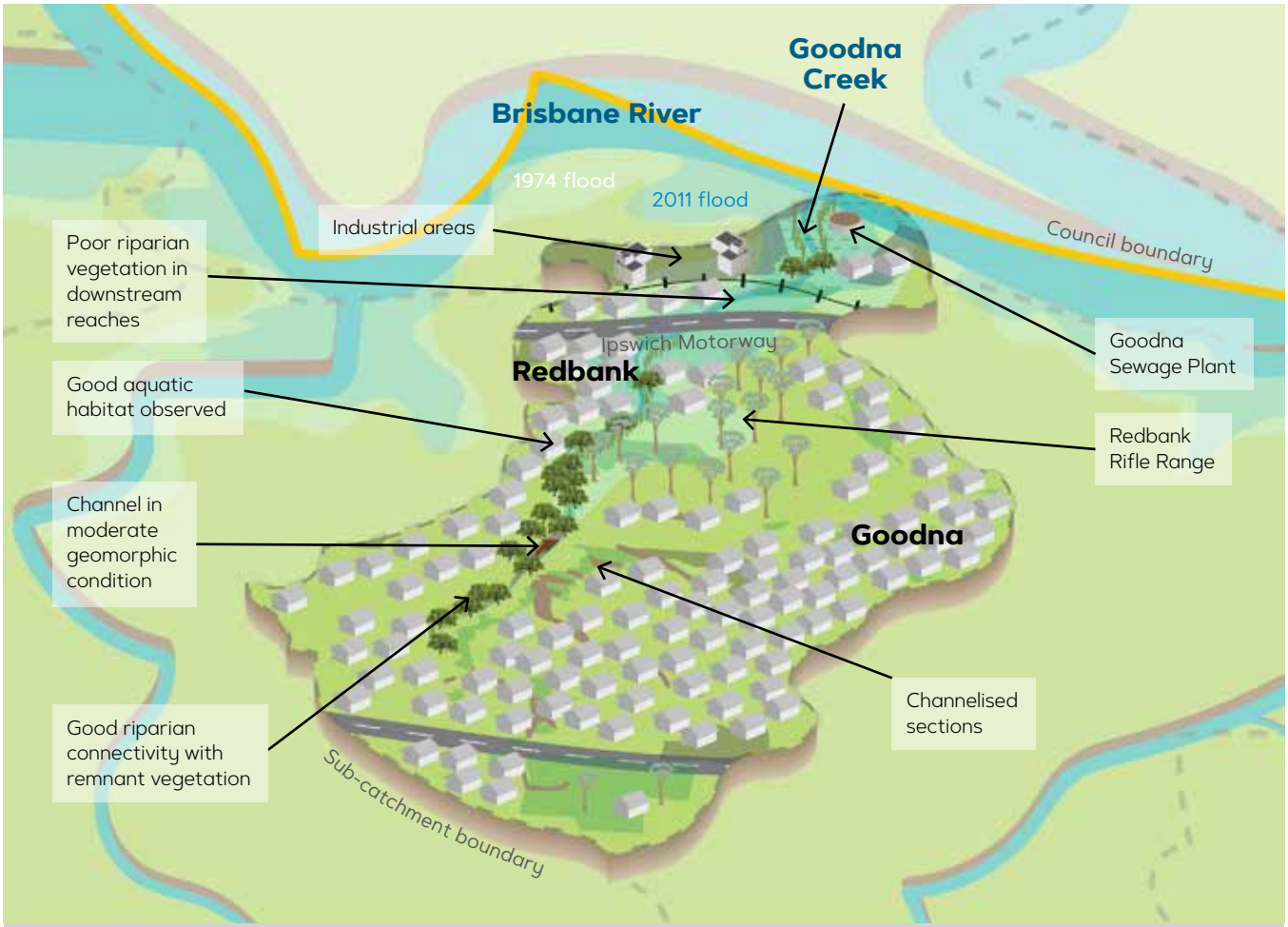
- Goodna Creek
- Lower Brisbane River
- Sandy Creek (Camira)
- Six Mile Creek
- Woogaroo Creek, including Mountain and Opossum creeks.

FIGURE 12 – Lower Brisbane River Catchment and Sub-Catchments



GOODNA CREEK

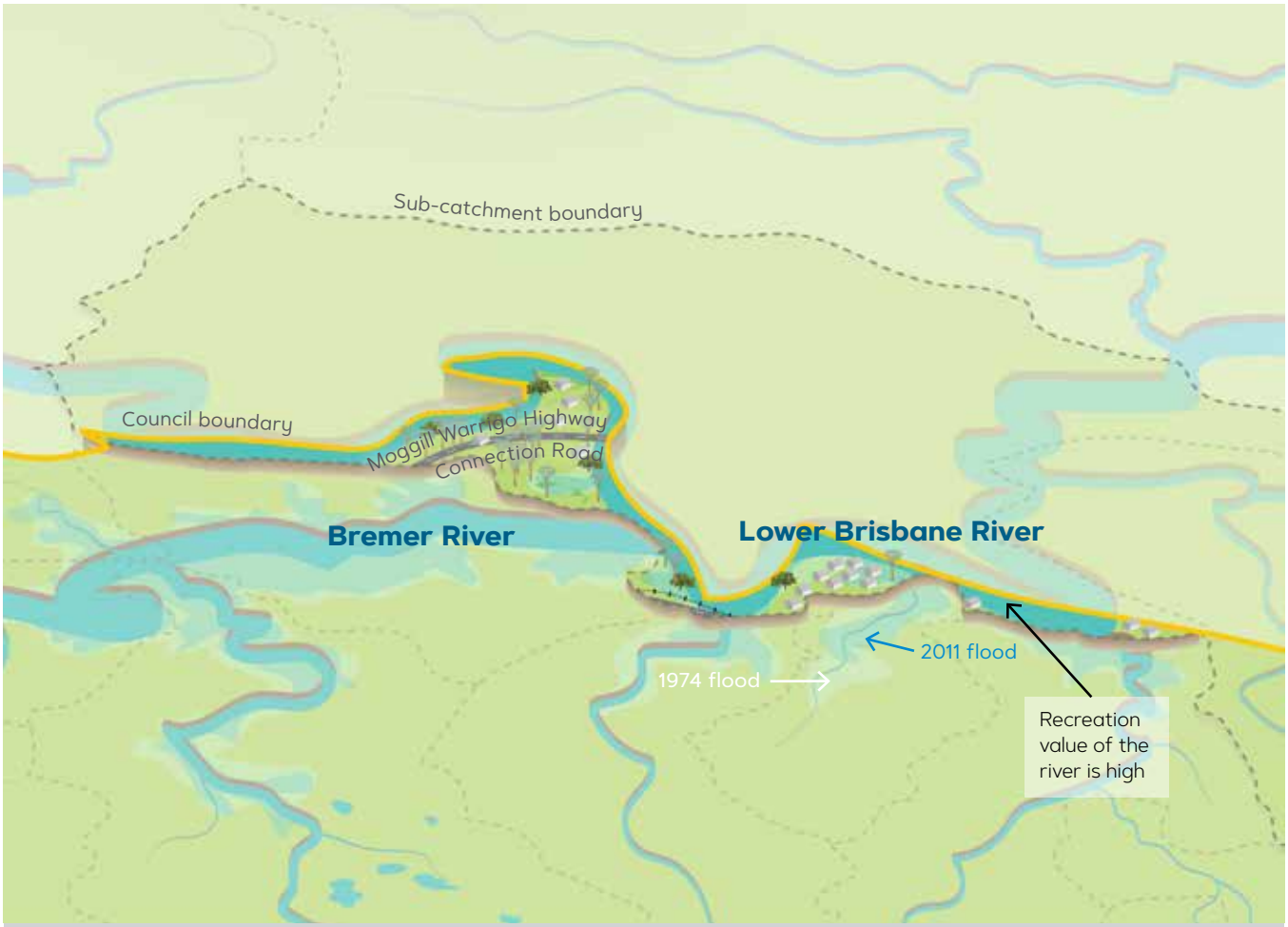
The Goodna Creek sub-catchment covers only 14km². The creek flows through the suburbs of Redbank Plains and Collingwood Park, before entering the Lower Brisbane River 5km downstream of the Moggill Ferry crossing.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Variable channel form with a mixture of chain of ponds, constructed and continuous channels ▪ Historic widening however current rates of erosion appear low ▪ Good aquatic habitat present with no water quality, invertebrate or fish data available ▪ Goodna Sewage Treatment Plant discharges directly into the Brisbane River.
Riparian	▪ Riparian condition varies along the creek with good connectivity upstream of the Ipswich Motorway and poor vegetation cover in the lower reach.
Floodplain	▪ Floodplain is a mix of urban, light industrial, grassland, parks, sportsgrounds and bushland ▪ No non-riverine wetlands mapped in the sub-catchment.
Community	▪ Indigenous artefacts have been located in the sub-catchment ▪ About 3.3km of the creek is adjacent to public parks and reserves.

LOWER BRISBANE RIVER

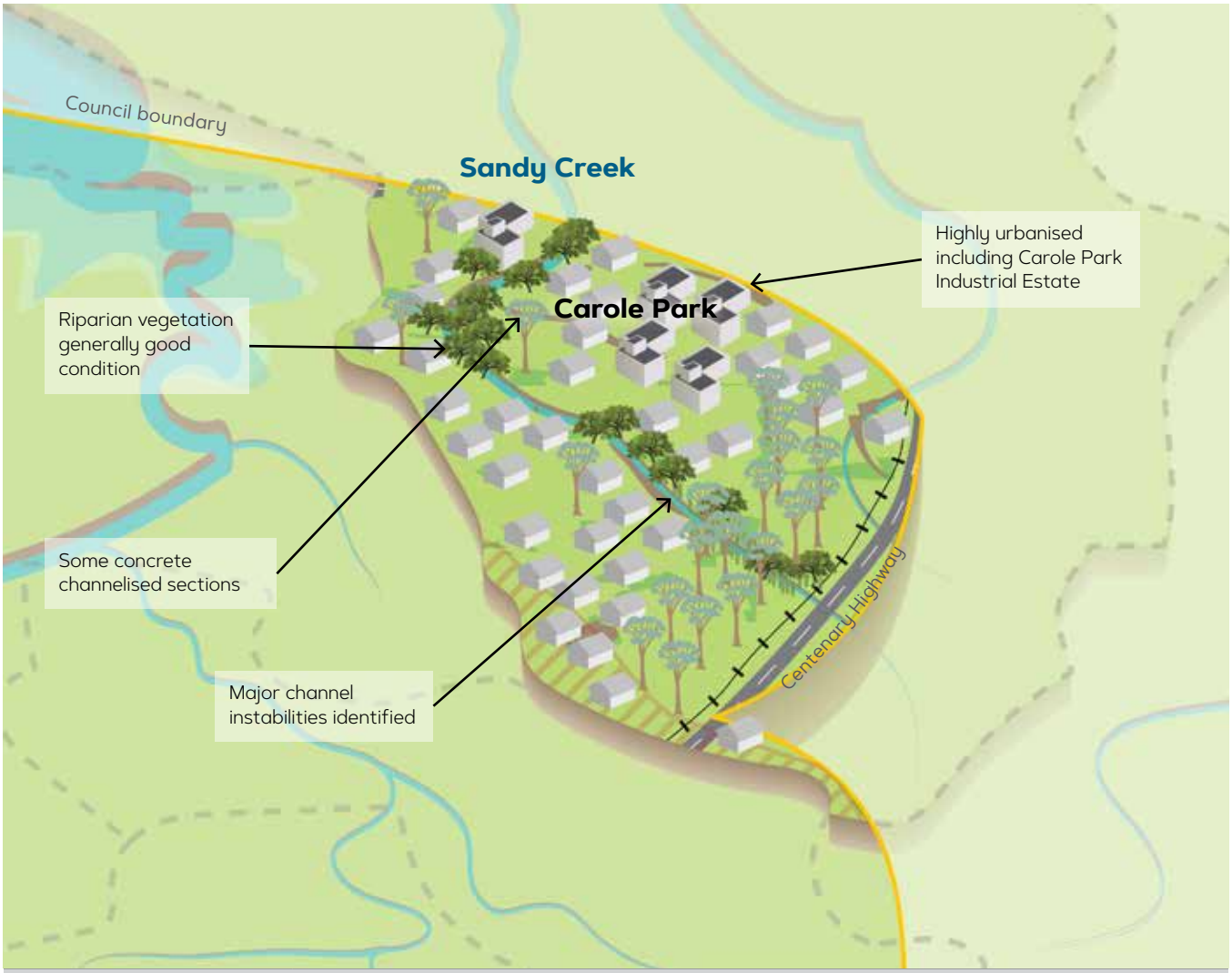
The Lower Brisbane River is estuarine and receives flows from the Goodna, Woogaroo, Six Mile and Sandy Creek (Camira) sub-catchments.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Variable channel form with some areas of degradation ▪ Good to moderate water quality with risk for potential microbial pollution due to on-site sewerage systems at Riverdale Park ▪ Moderate aquatic habitat.
Riparian	▪ Poor riparian condition.
Floodplain	▪ Floodplain is predominately grassland and bushland with small area of urban development ▪ Wivenhoe Dam and Somerset Dam have significantly altered flow regimes with flow variability significantly reduced.
Community	▪ About 7km of the waterway is adjacent to public parks and reserves with the remaining areas privately owned.

SANDY CREEK (CAMIRA)

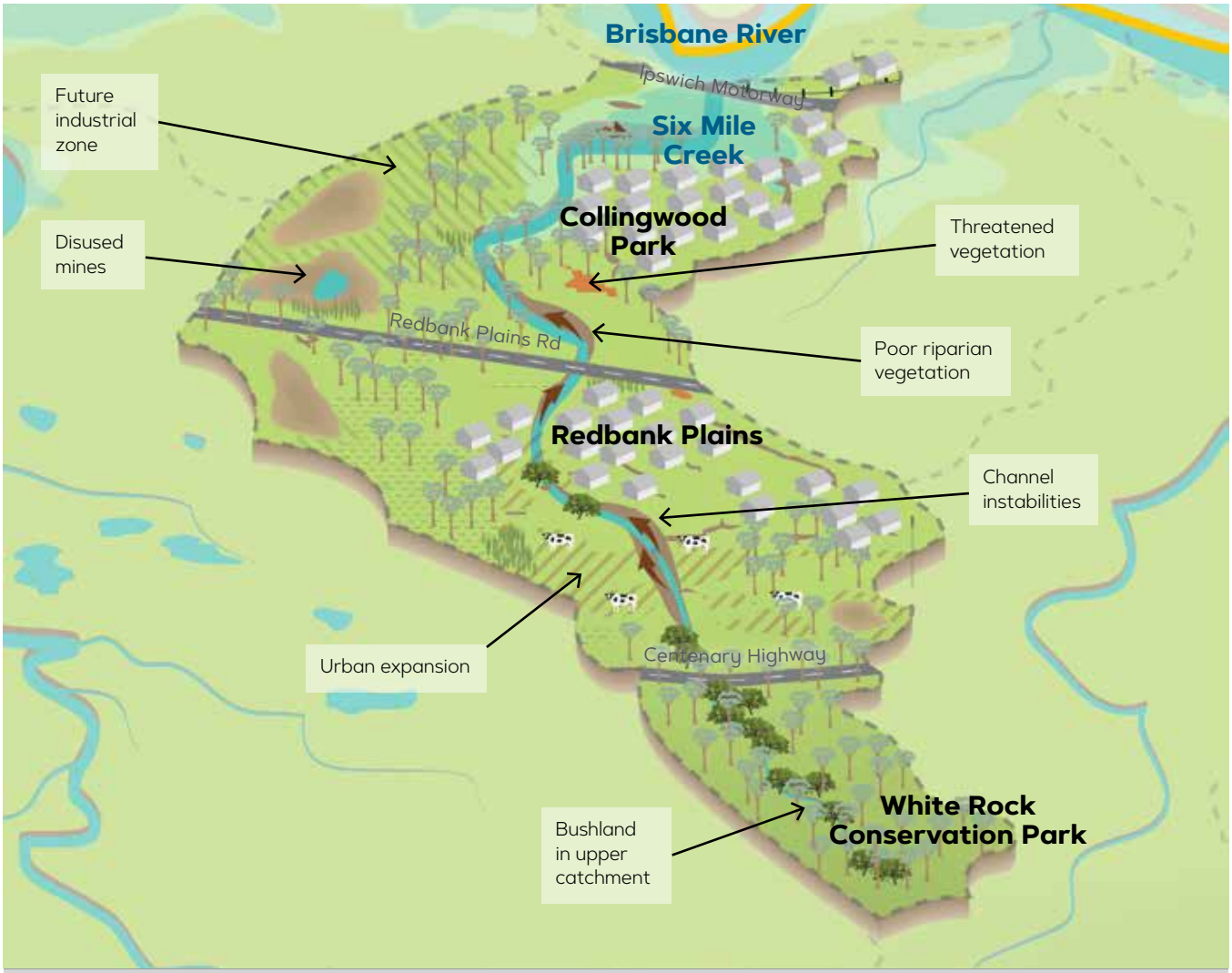
The 25km² sub-catchment area within the Ipswich LGA flows through Camira and Carol Park before entering Wolston Creek.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Variable channel form with some concrete channel sections and areas of active erosion due to increased runoff from urbanisation ▪ Poor aquatic habitat with no water quality, invertebrate or fish data available ▪ Anecdotal sightings and recent detection of Platypus.
Riparian	▪ Moderate riparian condition with good longitudinal connectivity but some weeds present.
Floodplain	▪ Land use is a mixture of urban, light industrial (Carole Park Industrial Estate) and bushland predominantly within the Greenbank Military Camp. ▪ Mapped palustrine wetlands in the upper sub-catchment.
Community	▪ Registered Indigenous cultural heritage site of the Camira Bora Ring ▪ About 1.4km of Sandy Creek's length is adjacent to public parks and reserves ▪ Council has a number of conservation partnerships with landholders.

SIX MILE CREEK

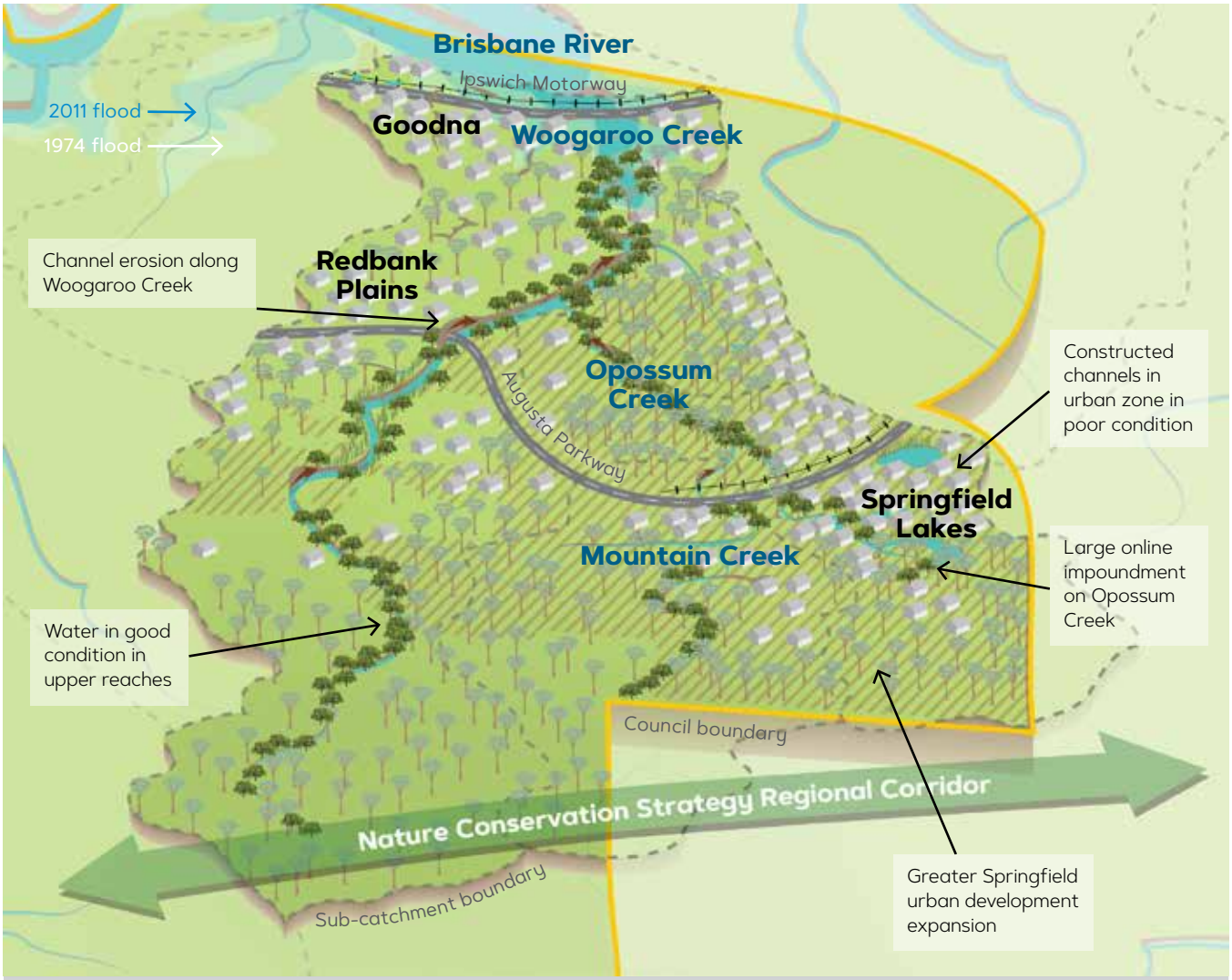
The sub-catchment covers an area of 31km². The creek flows north from the White Rock – Spring Mountain Conservation Estate and through suburban areas to join the Brisbane River downstream of Moggill Road Ferry.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Channel form and condition varies with bed and bank instabilities evident in multiple locations due to clearing of riparian vegetation and modification of channels ▪ Moderate aquatic habitat with no water quality, macroinvertebrate or fish data available ▪ Anecdotal sighting and recent detection of Platypus.
Riparian	▪ Riparian condition varies with poor connectivity overall and presence of weeds ▪ Degradation in the middle and lower reaches as a result of riparian vegetation removal, channelization and impoundments (voids from historic mine sites).
Floodplain	▪ Floodplain is a mix of bushland, cleared grassland and urban land uses ▪ Vegetation contains some mapped endangered communities ▪ Water storages including large mining voids.
Community	▪ Registered Indigenous artefacts have been located ▪ About 7.8km of the length of Six Mile Creek is adjacent to public parks and reserves ▪ Number of voluntary conservation partnerships with landholders.

WOOGAROO CREEK

The sub-catchment area of Woogaroo Creek and its tributaries, Mountain Creek and Opossum Creek, covers 65km² within the Ipswich LGA. The creek headwaters arise in the White Rock – Spring Mountain Conservation Estate.

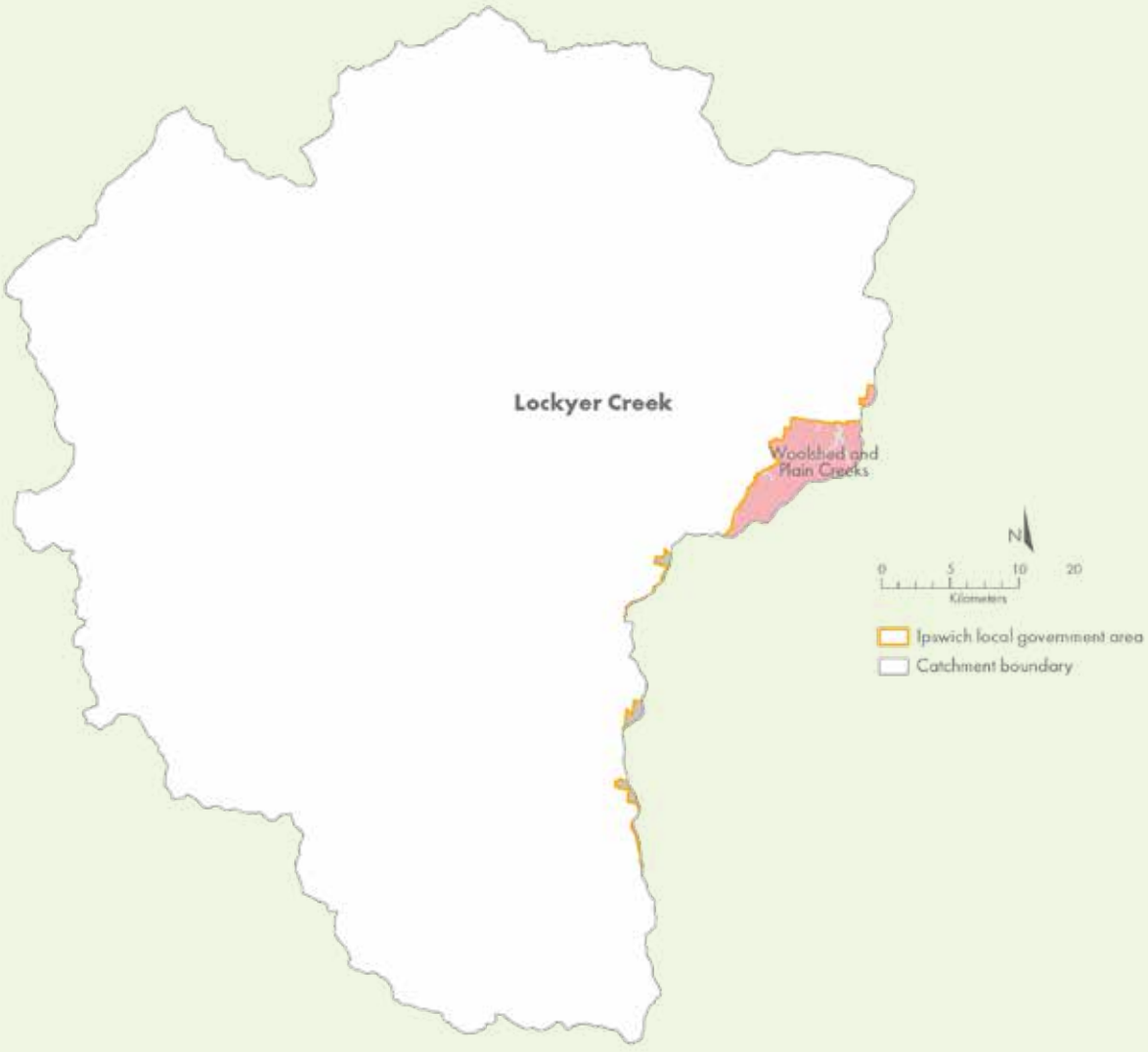


MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Variable channel form with upper reaches in good condition and some modifications and instabilities in urbanised areas ▪ Moderate aquatic habitat present overall, although poor condition in the constructed channels in the urban zone ▪ No water quality, invertebrate or fish data available ▪ Platypus sighted and detected.
Riparian	▪ Good riparian condition overall with good cover and connectivity along the creek but weeds are present.
Floodplain	▪ Floodplain consists mostly of grassland and bushland and only a small area of urban land uses.
Community	▪ Registered Indigenous cultural heritage sites identified and large number of artefacts located near Mountain Creek ▪ About 20km of waterways adjacent to public parks and reserves ▪ A number of council partnerships with landholders and community-driven initiatives.

LOCKYER CREEK CATCHMENT

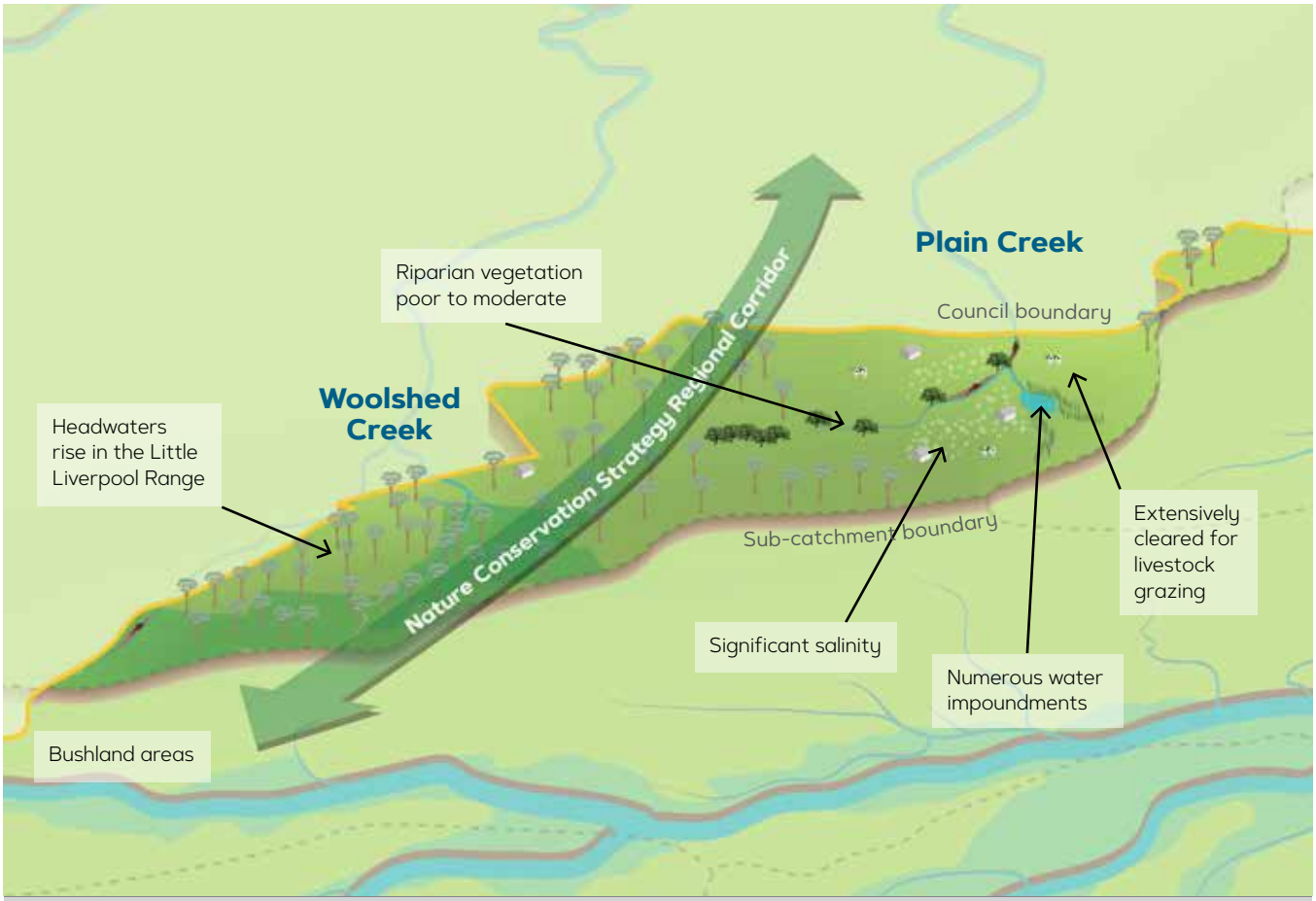
The Lockyer Creek Catchment covers a total area of 2,974km^2 and as a whole has the highest proportion of land used for intensive agriculture in South-East Queensland. Only a small portion of the upper reaches of the sub-catchment (which includes Woolshed and Plain Creeks) are located in the Ipswich LGA.

FIGURE 13 – Lockyer Creek Catchment



LOCKYER CREEK

Only the upper reaches of Woolshed and Plain Creeks have a partial area within the Ipswich LGA. The headwaters of these creeks rise in the Little Liverpool Range and cover 38km² within the Ipswich LGA before they continue to flow north into the Lockyer Valley Regional Council area.



MANAGEMENT THEME	CURRENT CONDITION
Channel	▪ Woolshed Creek is a continuous channel with minor instabilities, while Plain Creek is a continuous, sinuous channel ▪ Variable channel form with widespread degradation due to stock impacts and lack of riparian vegetation ▪ Variable aquatic habitat condition with only six species of native fish identified in Woolshed Creek ▪ Macroinvertebrates and water quality in moderate condition with extremely high salinity measurements.
Riparian	▪ Riparian corridor in moderate condition in Woolshed Creek and poor condition in Plain Creek.
Floodplain	▪ Floodplain predominately grazing and bushland.
Community	▪ Waterway mostly flows through private land except for a section of Woolshed Creek which drains through Mount Grandchester Conservation Estate ▪ A number of voluntary conservation agreements with landholders.

APPENDICES

APPENDIX A –
WQOs AND EVs FOR IPSWICH WATERWAYS

TABLE A1 – Bremer River WQOs

Parameter	Unit	Scheduled WQOs – Bremer River				
		Mid estuary	Upper estuary	Lowland freshwater	Upland freshwater	FW lakes / reservoirs
Turbidity	**NTU**	<8	<25	<17 (<5 for Warrill Ck)	<17 (<5 for Warrill Ck)	1–20
SS	**mg/L**	<20	<25	<6	<6	
Chl A	**µg/L**	<4	<8	<5	<2	<5
TN	**µg/L**	<300	<450	<500	<250	<350
TP	**µg/L**	<25	<30	<50	<30	<10
DO (20th – 80th percentile)	**% sat**	85–105	80–105	85–110	90–110	90–110
pH		7.0–8.4	7.0–8.4	6.5–8.0	6.5–8.2	6.5–8.0
Cond	**µS/cm**			<770 (<500 for Warrill Ck)	<770 (<500 for Warrill Ck)	
Secchi (20th percentile)	**m**	>1.0	>0.5			

TABLE A2 – Brisbane River WQOs

Parameter	Unit	Scheduled WQOs – Mid Brisbane River		Scheduled WQOs – Mid Brisbane River		
		Upland freshwater	Lowland freshwater	Upper estuary	Middle estuary	Lowland freshwater
Turbidity	**NTU**	<5	<5	<25	<8	<50
SS	**mg/L**	<6	<6	<25	<20	<6
Chl A	**µg/L**	<2	<5	<8	<4	<5
TN	**µg/L**	<250	<500	<450	<300	<500
TP	**µg/L**	<30	<30	<30	<25	<50
DO (20th – 80th percentile)	**% sat**	90–110	85–110	85–105	85–105	85–110
pH		6.5–8.2	6.5–8.0	7.4–8.4	7.0–8.4	6.5–8.0
Cond	**µS/cm**	<380	<380			<600
Secchi (20th percentile)	**m**			>0.5	>1.0	

FIGURE A1 – Bremer River EVs and key identifying location of different waterway types within ICC LGA

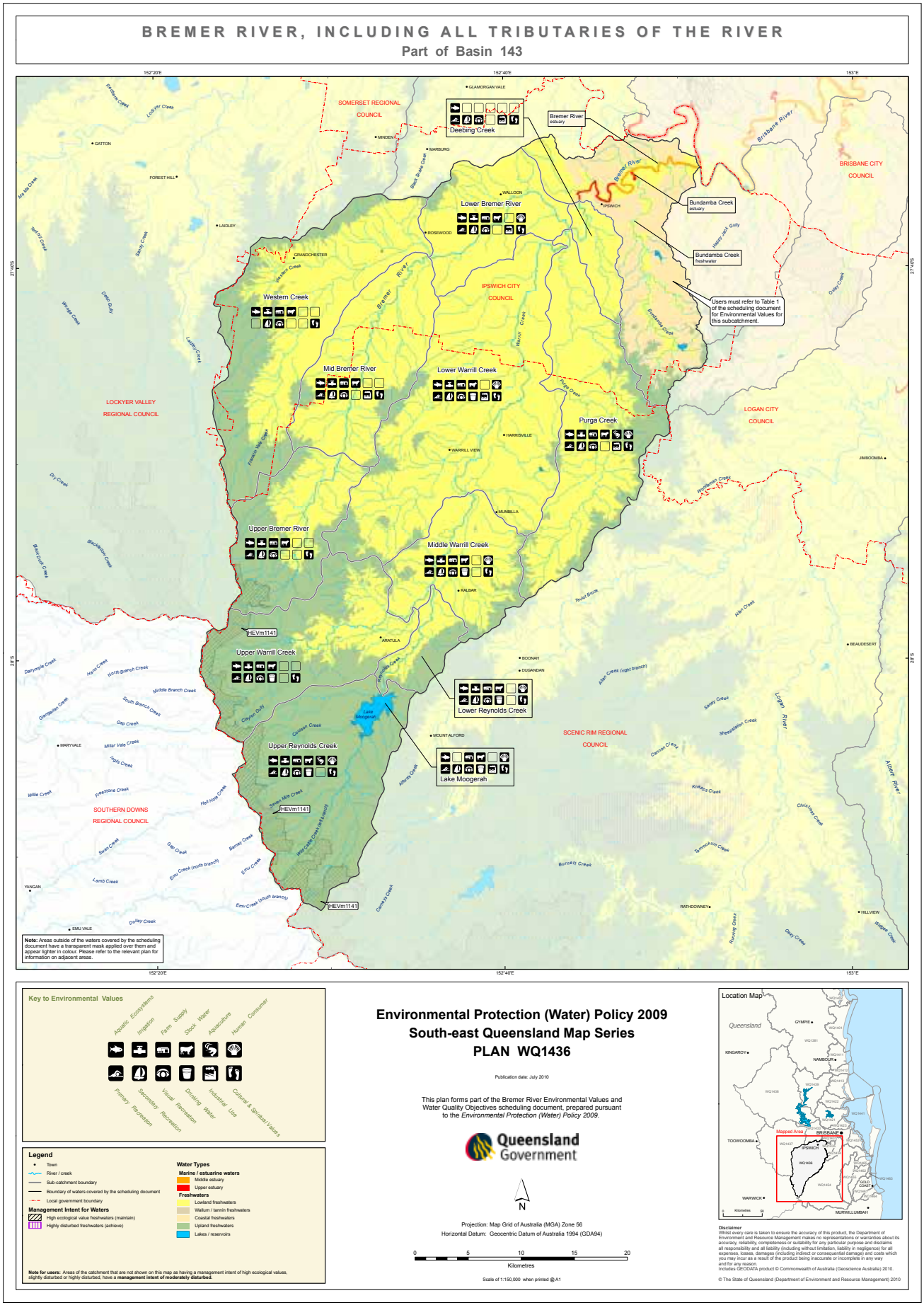
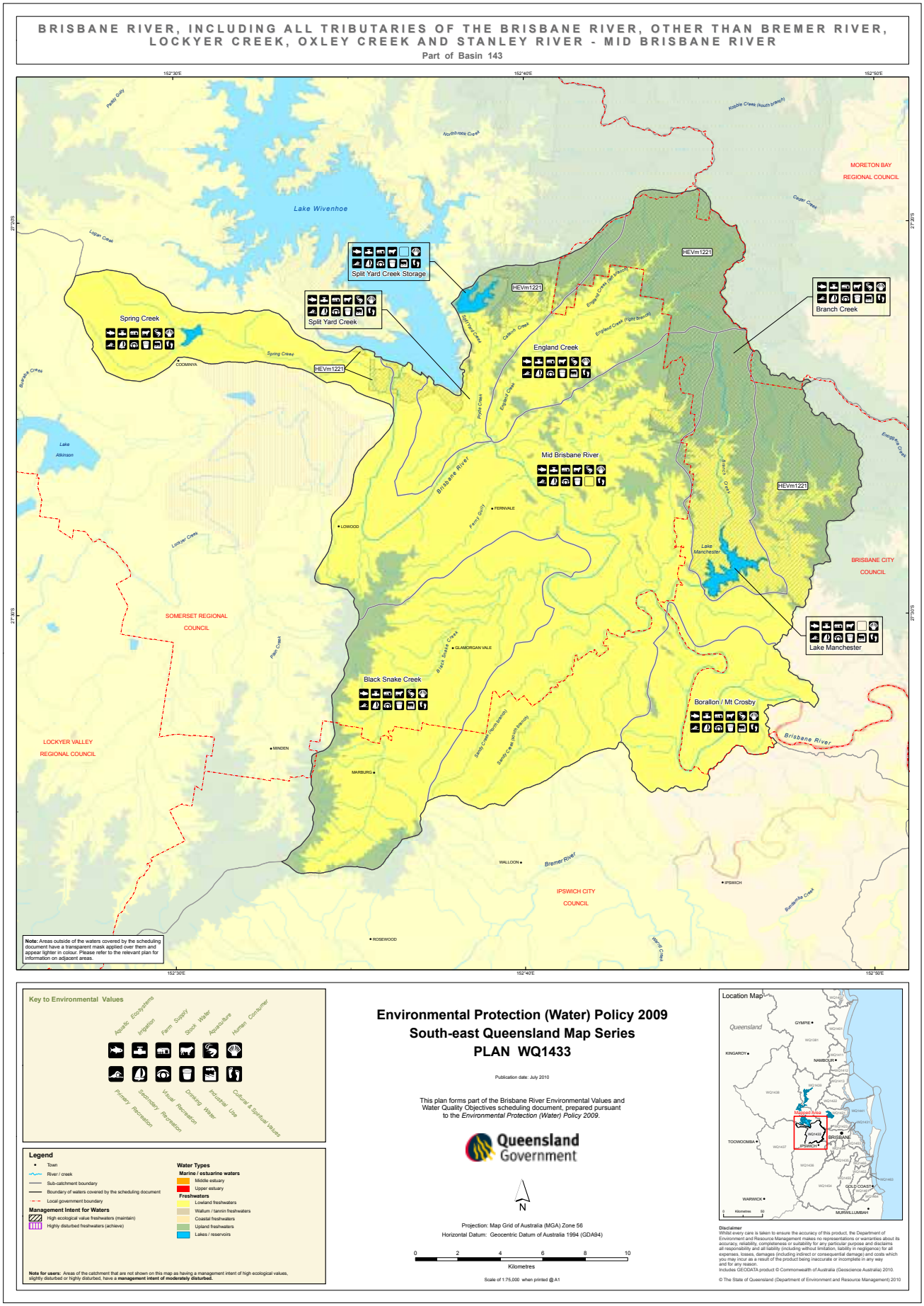
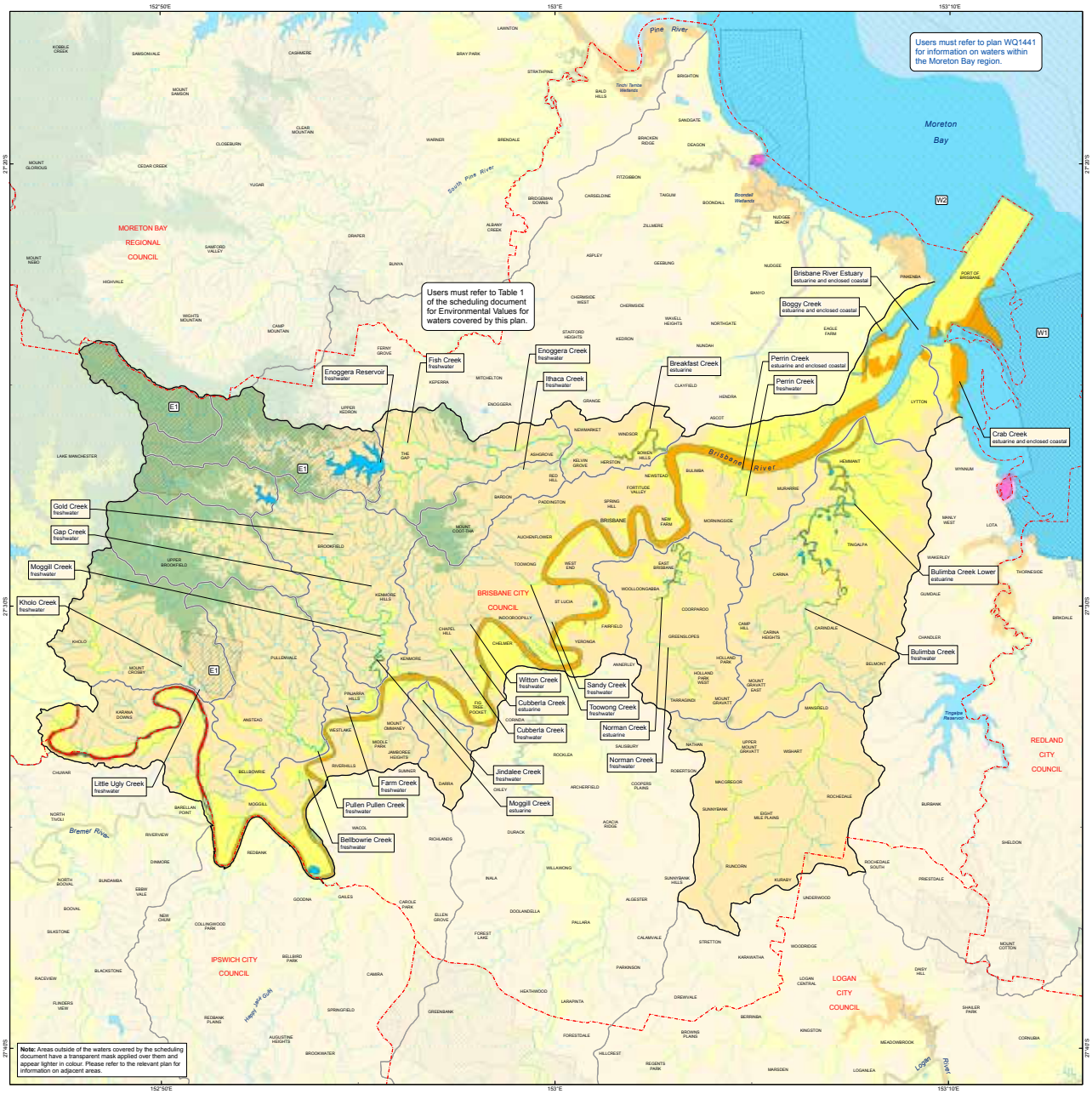


FIGURE A2 – Brisbane River mid (below) and Brisbane River estuary (page 67) EVs and key identifying location of different waterway types within ICC LGA



BRISBANE RIVER, INCLUDING ALL TRIBUTARIES OF THE BRISBANE RIVER, OTHER THAN BREMER RIVER, LOCKYER CREEK, OXLEY CREEK AND STANLEY RIVER - BRISBANE RIVER ESTUARY

Part of Basin 143



Key to Environmental Values

Legend

River / creek
Coastline
Sub-catchment boundary
Boundary of waters covered by the scheduling document
Local government boundary

Management Intent for Waters

High ecological value freshwaters (maintain)
High ecological value marine / estuarine waters (maintain)
High ecological value marine / estuarine waters (achieve)
Moreton Bay sub-zones

Water Types

Marine / estuarine waters
Open coastal waters
Enclosed coastal / lower estuary
Middle estuary
Upper estuary
Tidal canals / constructed estuaries / marinas / boat harbours

Freshwaters
Lowland freshwaters
Wallum / tannin freshwaters
Coastal freshwaters
Upland freshwaters
Lakes / reservoirs

Note for users: Areas of the catchment that are not shown on this map as having a management intent of high ecological values, slightly disturbed or highly disturbed, have a **management intent of moderately disturbed.**

Environmental Protection (Water) Policy 2009
South-east Queensland Map Series
PLAN WQ1431

Publication date: July 2010

This plan forms part of the Brisbane River Environmental Values and Water Quality Objectives scheduling document, prepared pursuant to the *Environmental Protection (Water) Policy 2009*.

Queensland Government

N

Projection: Map Grid of Australia (MGA) Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

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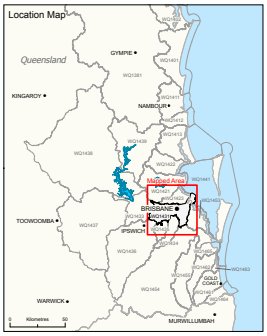
Location Map



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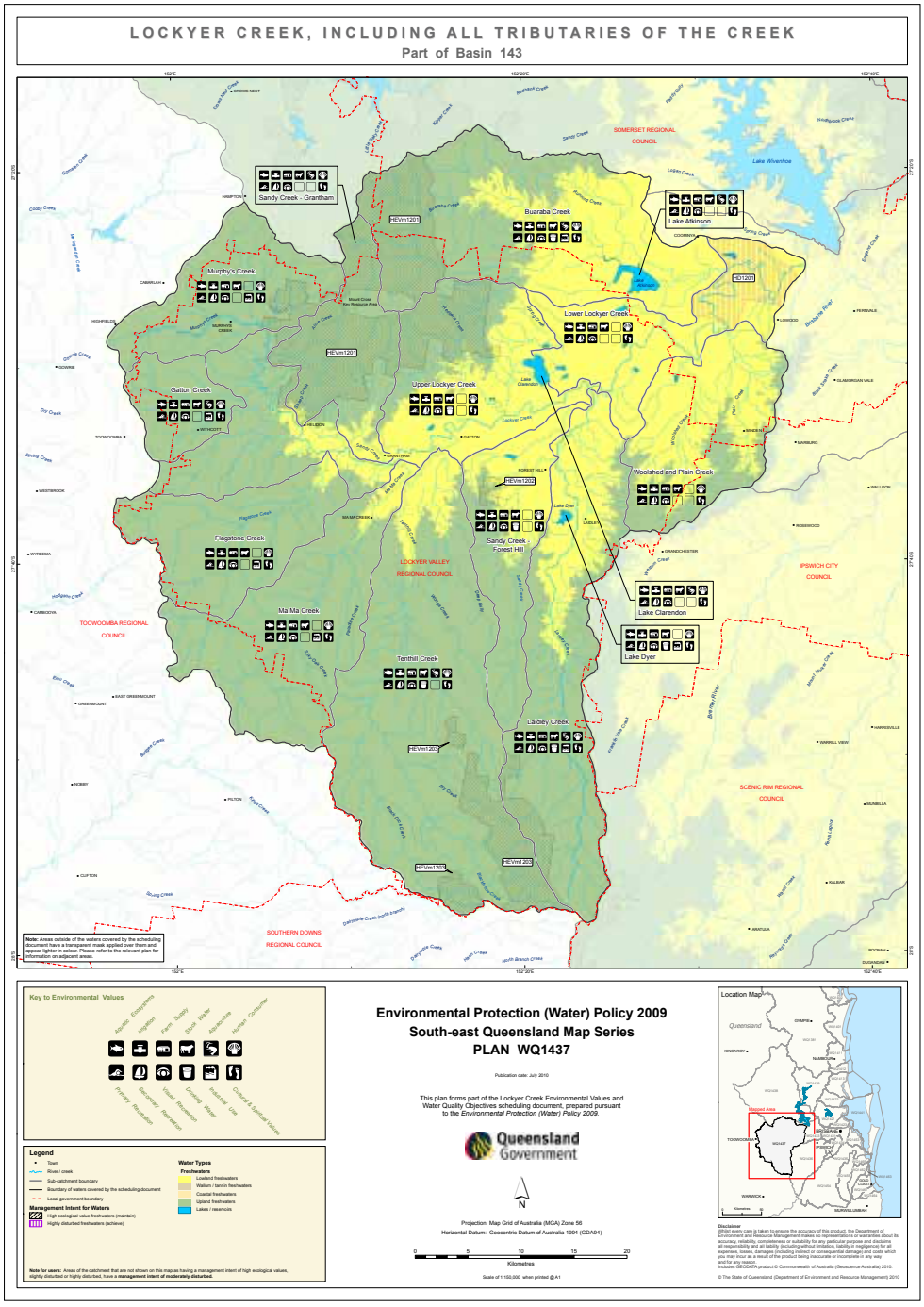
Includes GEODATA product © Commonwealth of Australia (Geoscience Australia) 2010.

TABLE A3 – Lockyer Creek WQOs

Parameter	Unit	Scheduled WQO's – Lockyer Creek	
		Upland freshwater	Lowland freshwater
Turbidity	**NTU**	<5	<6
SS	**mg/L**	<6	<6
Chl A	**µg/L**	<2	<5
TN	**µg/L**	<250	<500
TP	**µg/L**	<30	<50
DO (20th – 80th percentile)	**% sat**	90–110	85–110
pH		6.5–8.2	6.5–8.0
Cond	**µS/cm**		<380
Secchi (20th percentile)	**m**		

FIGURE A3 – Lockyer Creek EVs and key identifying location of different waterway types within ICC LGA



APPENDIX B –
KEY NATIONAL AND STATE LEGISLATION RELEVANT TO WATERWAY HEALTH MANAGEMENT

Document title	Description	Relevance to Ipswich City Council
Federal legislation		
Environment Protection and Biodiversity Conservation (EPBC) Act 1999	Protection and conservation of nationally significant ecological communities, wetlands and species, including: world heritage properties, national heritage properties and Ramsar wetlands.	Referral agency for development applications that impact on species or communities listed under the *EPBC Act 1999*.
State legislation		
Water Act 2000	Provides for the sustainable management of water in respect to: works for taking or interfering with water; water allocation; and protection and improving the physical integrity of watercourses, lakes and springs. The Act controls the removal of native vegetation from nontidal watercourses through the Riverine Protection Permit, administered by DNRM&E. Includes sub-ordinate legislation: ▪ Water Regulation 2002 ▪ Moreton Resource Plan ▪ Resource Operations Plan ▪ Drought Management Plans ▪ System Leakage Management Plans.	Council is required to develop and implement operational plans that meet requirements of the act, such as: ▪ Water Efficiency Management Plans (WEMPs) ▪ Drought Management Plan.
Environmental Protection Act 1994	Protection and control of degradation and Queensland's environment, encompassing the principles of Ecologically Sustainable Development. Includes sub-ordinate legislation and requirements, including: ▪ environmental protection policys ▪ environmental values and water quality objectives ▪ state of the environment reporting.	Council is required to develop plans and address compliance to the Act, through regulatory enforcement of Environmentally Relevant Activities (ERAs) etc.
Nature Conservation Act 1992	Provides a framework for identifying, gazetting and managing protected areas to maintain natural conditions, and provides a list of faunal and floral scheduled species.	Council's Nature Conservation Strategy sets the direction for the protection and enhancement of Ipswich's natural areas.
Vegetation Management Act 1999	Regulate the clearing of vegetation in a way that: ▪ conserves endangered, of concern and not of concern regional ecosystems ▪ vegetation in declared areas ▪ doesn't cause land degradation ▪ prevents loss of biodiversity ▪ maintains ecological processes ▪ reduce greenhouse gas emissions. Provides vegetation management codes that quantify riparian buffer widths for different water types. Sets retention of riparian vegetation and retention of clumps or corridors.	Council meets requirements under the Act through planning codes for assessment of vegetation clearing.

Document title	Description	Relevance to Ipswich City Council
Fisheries Act 1994	Management and protection for fish resources and fisheries habitats.	Council meets requirements under the Act through referral of activities that impact on freshwater and marine fish habitats and the clearing of marine plants in tidal areas.
Coastal Protection and Management Act 1995	Provides for the protection, conservation, rehabilitation and management of the coast, coastal zone and its resources. Includes: ▪ Regional Coastal Management Plans ▪ Coastal Management Districts.	Restricts the type and amount of development within the Coastal Management Districts. Council meets requirements under the Act through referral of relevant development applications that impact on tidal waterways.
Planning Act 2016	Provides the planning framework for ecological sustainable development across Queensland. This includes: ▪ planning ▪ development assessment ▪ infrastructure (charges etc) ▪ offences and enforcement ▪ dispute resolution.	Council is required to develop local planning instruments (planning scheme, planning scheme policies etc). This includes requirements for development to protect the natural environment, waterways and wetlands.
Biosecurity Act 2014	Provides a framework for controlling declared plants and animal pests, diseases and contaminants.	Council's Biosecurity Plan (2018–2023) sets the direction for the Management of invasive plants and animals across Ipswich. Council is responsible for controlling invasive species on council land and to work with landholders in a regulatory function.
State Planning Policy 2017	Supports the *Planning Act 2016* by setting the State's interests that apply to planning. These state interests include the following environment and heritage interests: ▪ biodiversity ▪ coastal environment ▪ cultural heritage ▪ water quality.	Council's planning scheme reflects the state interests in terms of requirements for environmental and waterway protection.
Environmental Offsets Act 2014	Council's planning scheme reflects the state interests in terms of requirements for environmental and waterway protection.	Council offsets reflects the Act requirements.
Rivers Improvement Trust Act 1940	Outlines responsibilities of River Improvement Trusts which are statutory bodies established to protect and improve rivers.	Council works with the Ipswich Rivers Improvement Trust to undertake works within waterways across Ipswich.
Aboriginal Cultural Heritage Act 2003	Recognises, protects and conserves Aboriginal cultural heritage in Queensland.	Council recognises waterways and wetlands have deeply embedded significant value as part of cultural landscapes and are offered protections as such.

APPENDIX C – REFERENCES

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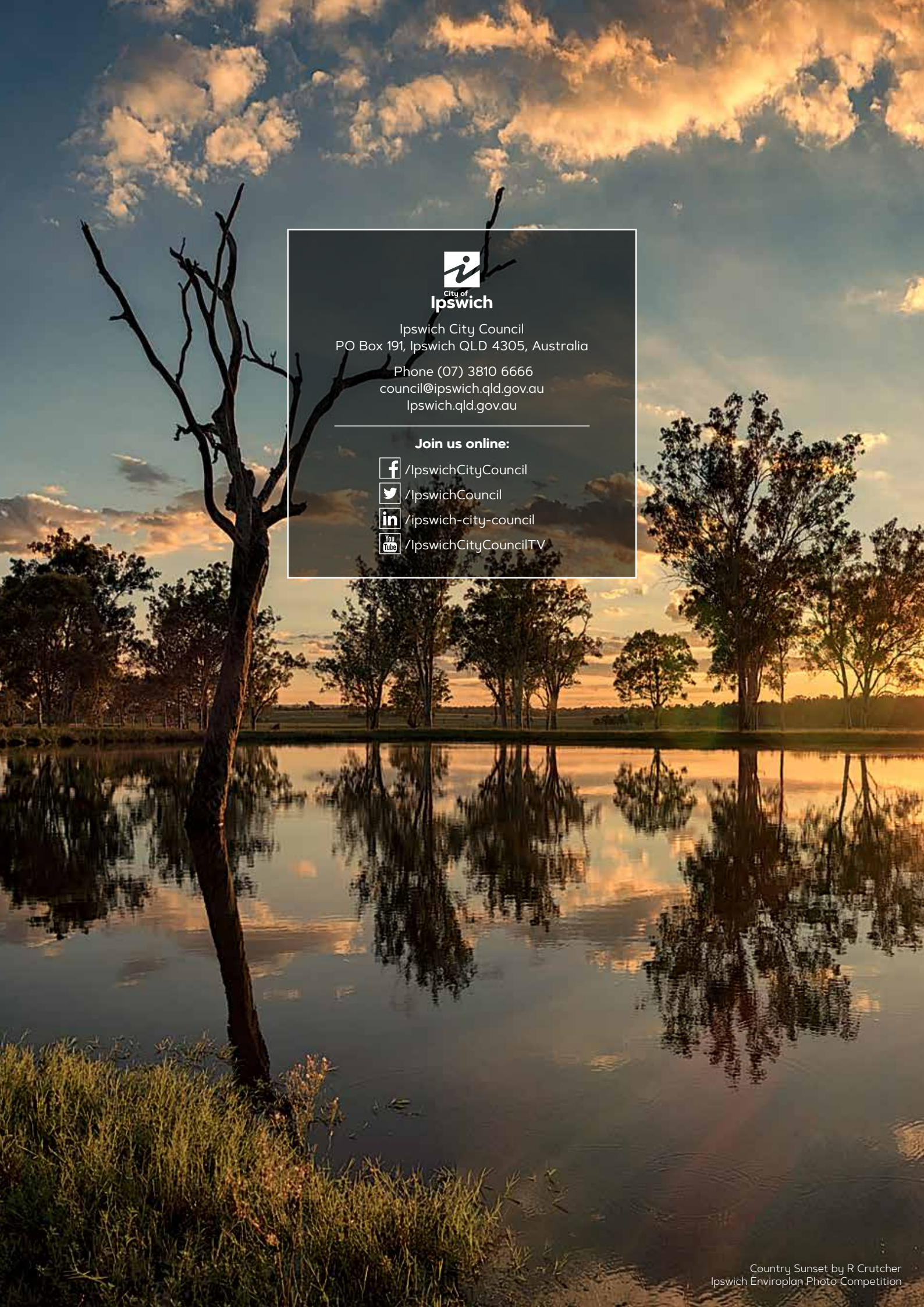

City of Ipswich

Ipswich City Council
PO Box 191, Ipswich QLD 4305, Australia

Phone (07) 3810 6666
council@ipswich.qld.gov.au
Ipswich.qld.gov.au

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