

STANDARDISE THE STANDARDS

STEP 4 OF THE PARRAMATTA RIVER MASTERPLAN
DUBA, BUDU, BARRA

FINAL DISCUSSION PAPER

FEBRUARY 2020



Client



Co-ordinating agency and end client



Lead agency and direct client

Consultant team



Project name: Standardise the Standards

Project number: 1902 (Civille)

Date: 26 February 2020

Report contact: Alexa McAuley, Civille

Report authors:

Alexa McAuley, Civille

Dr Peter Davies, Macquarie University

DISCLAIMER

This document is for the confidential use only of the party to whom it is addressed (the client) for the specific purposes to which it refers. We disclaim any responsibility to any third party acting upon or using the whole or part of its contents or reference thereto that may be published in any document, statement or circular or in any communication with third parties without prior written approval of the form and content in which it will appear. This document and its attached appendices are based on estimates, assumptions and information sourced and referenced by the authors. We present these estimates and assumptions as a basis for the reader's interpretation and analysis. With respect to forecasts we do not present them as results that will actually be achieved. We rely upon the interpretation of the reader to judge for themselves the likelihood of whether these projections can be achieved or not. If financial models have been included, they have been prepared from the best information available at the time of writing, no responsibility can be undertaken for errors or inaccuracies that may have occurred both with the programming or the financial projections and their assumptions. In preparing this document we have relied upon information concerning the subject property and/or study area provided by the client and we have not independently verified this information except where noted in this document.

DOCUMENT HISTORY AND STATUS

Revision	Status	Date	Checked
A	Draft for Sydney Water review	4 November 2019	AMcA
B	Draft for circulation and discussion	12 November 2019	AMcA
C	Final draft for review	20 February 2020	AMcA
D	Final for circulation	26 February 2020	AMcA

CONTENTS

1	Introduction	1	3.5	Plan for monitoring and review	34
1.1	Making the Parramatta River swimmable again	1	3.6	Support implementation, including sustainable funding	34
1.2	Standardising the Standards	2	4	Recommendations and next steps	36
1.3	Links with other Masterplan actions	2	4.1	Wicked problems need an adaptive approach.....	36
1.4	This discussion paper	4	4.2	Start with the framework	38
2	Policy context	6	4.3	Maintain a clear line of sight to waterway health.....	38
2.1	NSW coastal and marine environment policy	6	4.4	It's not all about 'standardising'	38
2.1.1	Marine Estate Management Act.....	6	5	References	39
2.1.2	Coastal Management Act	7			
2.1.3	Coastal Management Planning	9			
2.2	NSW planning system	10			
2.3	Metropolitan and district plans.....	10			
2.4	Local Planning.....	13			
2.5	Current WSUD policy.....	13			
2.6	Why we need to improve stormwater and waterway management	15			
3	Issues and opportunities.....	16			
3.1	Create stronger links with waterway health goals	24			
3.2	Get 'back to basics': set realistic requirements at different scales	28			
3.3	Encourage integrated, multi-purpose green infrastructure.....	30			
3.4	Provide for stronger protection and restoration of riparian corridors	31			

1 INTRODUCTION

‘Standardise the Standards’, Step 4 in the 2018 [Parramatta River Masterplan](#), involves developing a whole-of-catchment land use policy and statutory planning mechanisms

During 2019-20, Sydney Water engaged Civille and Macquarie University to undertake a project focused on Step 4. This discussion paper has been prepared by the project team to help progress the conversation on appropriate policies, planning instruments and sustainable funding mechanisms that will support the goals of the Parramatta River masterplan, and the particular actions identified under Step 4.

The NSW Department of Planning Industry and Environment (DPIE) and Sydney Water are both identified as lead agencies for delivering Step 4. Sydney Water has invited DPIE to be involved in the project throughout 2019-20. DPIE’s involvement has included progress meetings, project workshops and commenting on a draft of this discussion paper. Staff from the Place, Design and Public Spaces and the Environment, Energy and Science Group have been the main groups involved.

1.1 Making the Parramatta River swimmable again

The mission of the Parramatta River Catchment Group (PRCG) is to create a world class river and make the Parramatta River swimmable again. The Parramatta River Masterplan was released by the Parramatta River Catchment Group in 2018. The Masterplan covers the Parramatta catchment west of Cockatoo Island. In the Masterplan, the PRCG partners and the community have defined six elements of a healthy living Parramatta River, as shown in Figure 1.



Figure 1: Six aspects of a living river (Parramatta River Catchment Group 2018)

It is well understood that diffuse stormwater pollution remains a major contributing factor to poor water quality in the Parramatta River (e.g. see Sydney Water 2018), and governments at all levels must now focus their attention to managing diffuse pollution sources throughout the catchment. Specifically, the following objectives have been established for the Parramatta River:

- Reduce enterococci bacteria entering the Parramatta River from stormwater
- Reduce chemical contaminants entering the Parramatta River from stormwater
- Reduce the amount of stormwater runoff entering the Parramatta River
- Increase landscaped area for the Parramatta River catchment and increase focus on Water Sensitive Urban Design
- Improve natural environment outcomes relating to waterways in the Parramatta River catchment

The development of these objectives is discussed in detail in Section 3.1.

1.2 Standardising the Standards

Land use planning and provisions for new development are important tools to manage diffuse stormwater pollution, however there is a need to improve planning provisions and link them more clearly with catchment/waterway objectives. This has remained elusive as no single regulatory, policy or practice is able to adequately address the root cause, thus requiring a coordinated and diverse range of approaches. This is where 'standardising the standards' plays a role. The Standardising the Standards project team is working to progress the actions identified under Step 4 in the Masterplan, which include:

- Align standards with the Risk-based framework for considering waterway health outcomes in strategic land-use planning decisions.
- Ensure the capture and use of stormwater on all new developments and redevelopments through either:
 - an overarching policy mechanism for the entire catchment; or
 - a review of BASIX water targets for low to medium density housing and state environmental planning policy for high density residential, commercial, industrial and roads.

- Ensure bioretention (or equivalent stormwater management) systems are installed on local and major roads using a prioritisation framework, starting with all new roads and moving towards broad catchment coverage over time.
- Ensure an ongoing funding source is allocated to the monitoring and maintenance of all bioretention (or equivalent stormwater management) systems installed.
- Align all the above with council policies across all council areas within the Parramatta River catchment with consideration of water sensitive urban design guideline (Roads and Maritime Services).

Evident in these actions is that this work requires a co-ordinated approach between various state agencies and local governments. There are eleven local government areas (LGAs) which overlap the Parramatta River catchment area, each of which will have their own Local Strategic Planning Statement (LSPS), Local Environment Plan (LEP) and Development Control Plan (DCP). These local plans also need to be informed by and reflect the priorities in various State-level legislation, strategic plans, and standard templates. This project is not only about developing new or revised policies and planning instruments – it also needs to consider how these will be implemented, including sustainable funding mechanisms.

1.3 Links with other Masterplan actions

The ten steps of the Parramatta River Masterplan are shown in Figure 2. There are a few different types of actions in the Masterplan:

- Steps 1-3 are focused on the River itself
- Steps 4-8 are focused in improving the catchment so that it can support a healthy river – improving source control, reducing stormwater runoff and wastewater overflows, and improving the natural environment
- Steps 9 and 10 are focused on how the Masterplan will be implemented



Figure 2: Ten Steps to a Living River – the ten steps identified in the Parramatta River Masterplan (Parramatta River Catchment Group 2018)

Among Steps 4-8, Step 4 has a particular focus on improving the outcomes from new development. However there are strong links between Step 4 and other Steps in the Masterplan, in particular:

- Step 5: Reduce Runoff – addressing diffuse stormwater pollution from the catchment, retrofitting stormwater treatment systems, supporting regional water quality offset schemes, education, capacity building and “establish legal instruments to ensure that new properties maintain their stormwater retention devices to their design intent”.
- Step 3: create new swimming spots – one of the ideas is to integrate new swimming sites and swim site activation locations in tributaries into relevant land use plans and instruments, including councils’ LEPs. Planning controls could also cover foreshore and waterway access more generally
- Step 8: bring in nature – healthy waterways, creeks, riparian zones will support biodiversity including the five iconic species
- Step 9: report back regularly – part of this should include monitoring what’s installed in new development and the outcomes achieved
- Step 10: creating clear leadership – one of the actions under Step 10 is to embed masterplan targets into State planning documents

1.4 This discussion paper

This discussion paper aims to define the problem and the challenges associated with Standardising the Standards, propose potential ways forward, and set up key discussion points for targeted workshops with stakeholders.

The discussion paper includes the following content:

- Section 2 outlines the policy context, covering both the NSW policy context and planning system, as well as current WSUD policy
- Section 1 explores issues with current WSUD policy, and identifies six major opportunities for improvement
- Section 1 defines the key principles and directions for planning reform, based on the opportunities identified in Section 1

The discussion paper has been informed by a stakeholder workshop held in August 2019, which was focused on defining the problem and discussing the challenges. It has also been informed by research into:

- The existing NSW planning framework, and the reforms currently underway
- Current water sensitive urban design (WSUD) policies and their implementation
- Examples of alternative policy approaches, both from elsewhere in NSW and interstate

This discussion paper was released as a draft in November 2019 and circulated to project stakeholders including representatives from PRCG member councils and DPIE. Written comments were received in January 2020 and the discussion paper has been updated in response to that feedback.

Meanwhile, the discussion paper has begun to feed into the next steps of the project. Following the release of the draft discussion paper, targeted workshops were held in late November and December 2019, to discuss the opportunities raised in this discussion paper and begin to develop recommendations for planning reform. Two workshops have been held – one focused on improving waterways and riparian land through the development process, and one focused on improving WSUD in new development.

During the first half of 2020, there will be further work to develop the recommendations, with a recommendations paper to be developed in consultation with stakeholders. A project timeline is shown in Figure 3, showing where the discussion paper fits into the process.

Both the discussion paper and the recommendations paper are expected to have a life beyond the 2019-20 project, as the issues identified in this paper are significant, substantial policy improvements are recommended, and the policy reform process will take time to implement.

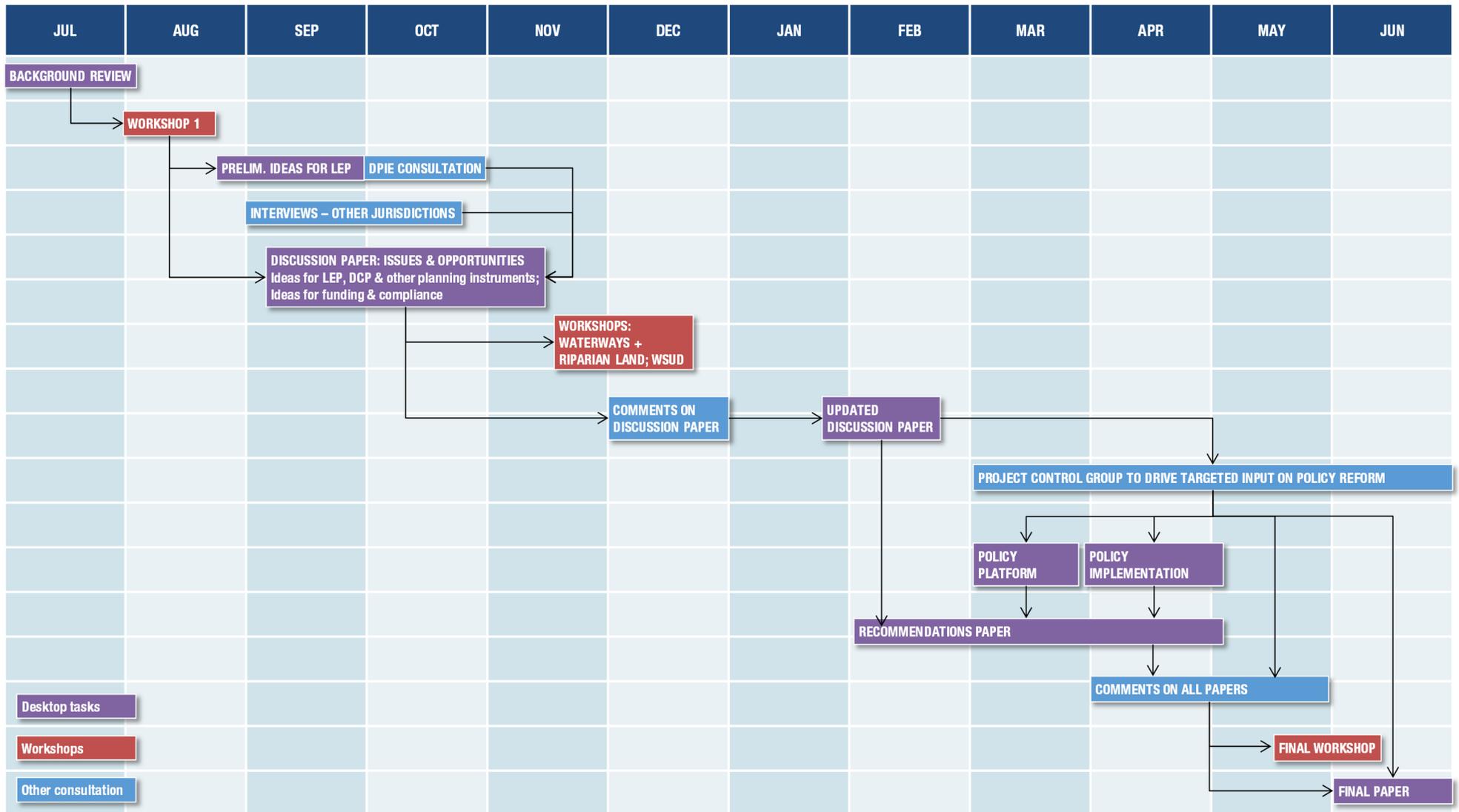


Figure 3: Standardise the Standards - project timeline

2 POLICY CONTEXT

The NSW planning system is currently undergoing significant reform. WSUD controls, first written into planning provisions more than a decade ago, are also due for review

The NSW Government has been making significant changes to planning and environmental policy over recent years, including:

- A new framework for marine and coastal management, including the new Marine Estate Management Act 2014 and the replacement of the Coastal Protection Act 1979 with the Coastal Management Act 2016
- A major update to the Environmental Planning and Assessment Act 1979
- Consolidation of State Environmental Planning Policies (SEPPs) and Regional Environmental Plans (REPs) into a smaller number of SEPPs, including the proposed Environment SEPP, which would replace seven existing SEPPs and REPs

Sydney also has a new metropolitan plan – A Metropolis of Three Cities (Greater Sydney Commission 2018a) and a series of new district plans. Sydney’s growth has now transitioned from majority greenfield to majority infill development, and this most recent metropolitan plan aims to accommodate more infill growth, with a focus on growth around existing centres, along transit corridors and in strategic renewal areas.

The infill development proposed in the Parramatta River catchment is expected to increase the impervious area in the catchment (Sydney Water 2018), increasing the pressure on the river from diffuse stormwater pollution. Infill development also presents new challenges for integrating water sensitive urban design into smaller developments on more constrained sites.

At the same time, local councils are currently updating their local planning provisions, addressing a number of recent changes:

- Council amalgamations have meant that many councils are currently operating with multiple different planning provisions operating in different parts of the LGA. There is a need to revise provisions to align with the new council areas

- The NSW Environmental Planning and Assessment (EP&A) Act underwent a major update in 2017, and local plans now need to be updated in line with the provisions in the revised Act
- Sydney has a new Metropolitan Plan and a set of district plans (Greater Sydney Commission 2018a, b, c, d), and councils need to align their local plans with these regional plans

An update of local planning provisions across the Parramatta River catchment is an opportunity to integrate new or revised provisions that will help meet the goals of the Parramatta River Masterplan. However this update also comes at a time when the timeline is driven by a bigger agenda, there are many competing needs and it is challenging to add another item to the mix. It is timely to bring a discussion about Standardising the Standards to the table, however it may be an iterative process to achieve all the aims of this step in the Masterplan.

2.1 NSW coastal and marine environment policy

There are two key pieces of NSW State Government legislation, supported by policies, programs and funding mechanisms, that are related to improving coastal waterways. These aim for similar goals to the Parramatta River Masterplan, and there is potential for mutually supportive approaches.

2.1.1 Marine Estate Management Act

The NSW Marine Estate Management Act 2014 and Marine Estate Management Regulation 2017 provide for strategic and integrated management of NSW’s marine waters, coasts and estuaries (i.e. including the Parramatta River below the weir). The NSW Marine Estate Management Strategy 2018-2028 has been developed to outline how the NSW Marine Estate Management Authority and other stakeholders will protect and enhance marine waters, coastline and estuaries over the next ten years. The

Strategy identifies urban stormwater discharge as a key threat to the marine estate, which impacts both on community enjoyment, participation, direct and indirect values and economic viability, and on wildlife health. The first of nine management initiatives in the strategy is to improve water quality and reduce litter, and the actions within this initiative include:

- Improving water quality in agricultural and urban catchments using a pilot-based implementation of the *Risk-based Framework*.
- Improve the management of diffuse-source water pollution by:
 - clarifying NSW Government and local government roles and responsibilities
 - building capacity to implement the *Risk-based framework*
 - using mechanisms within existing policy, planning and legislative frameworks to improve outcomes
 - improving minimum requirements for industry standards and ensuring compliance with regulations and best-practice through social research, education campaigns and compliance programs.
- Facilitating and delivering on-ground activities that reduce diffuse-source water pollution through investigation and provision of funding programs and financial incentives.
- Implementing a targeted marine litter campaign and establish a Marine Litter Working Group.
- Developing monitoring, reporting and performance indicators for water quality actions and fill key knowledge gaps. This action is integrated into the Monitoring Program.

We understand that there is currently work being carried out under the Marine Estate Management Strategy to update the NSW Water Quality and River Flow environmental objectives, which were published in 2006. This could put the community's goals for the Parramatta River into a more formal and recognisable framework.

2.1.2 Coastal Management Act

The NSW Coastal Management Act 2016 defines four coastal management areas (coastal wetlands and littoral rainforests, coastal vulnerability area, coastal environment area and coastal use area) and establishes management objectives for each, reflecting their different values.

The State Environmental Planning Policy (Coastal Management) 2018 maps these areas and specifies assessment criteria that apply to each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas.

The mapping for the Parramatta River catchment is shown in Figure 4. Within the Parramatta River catchment, other than two small coastal wetland areas in the west of the catchment, the other mapped coastal management areas are all closely associated with the Parramatta River and its tidal tributaries.

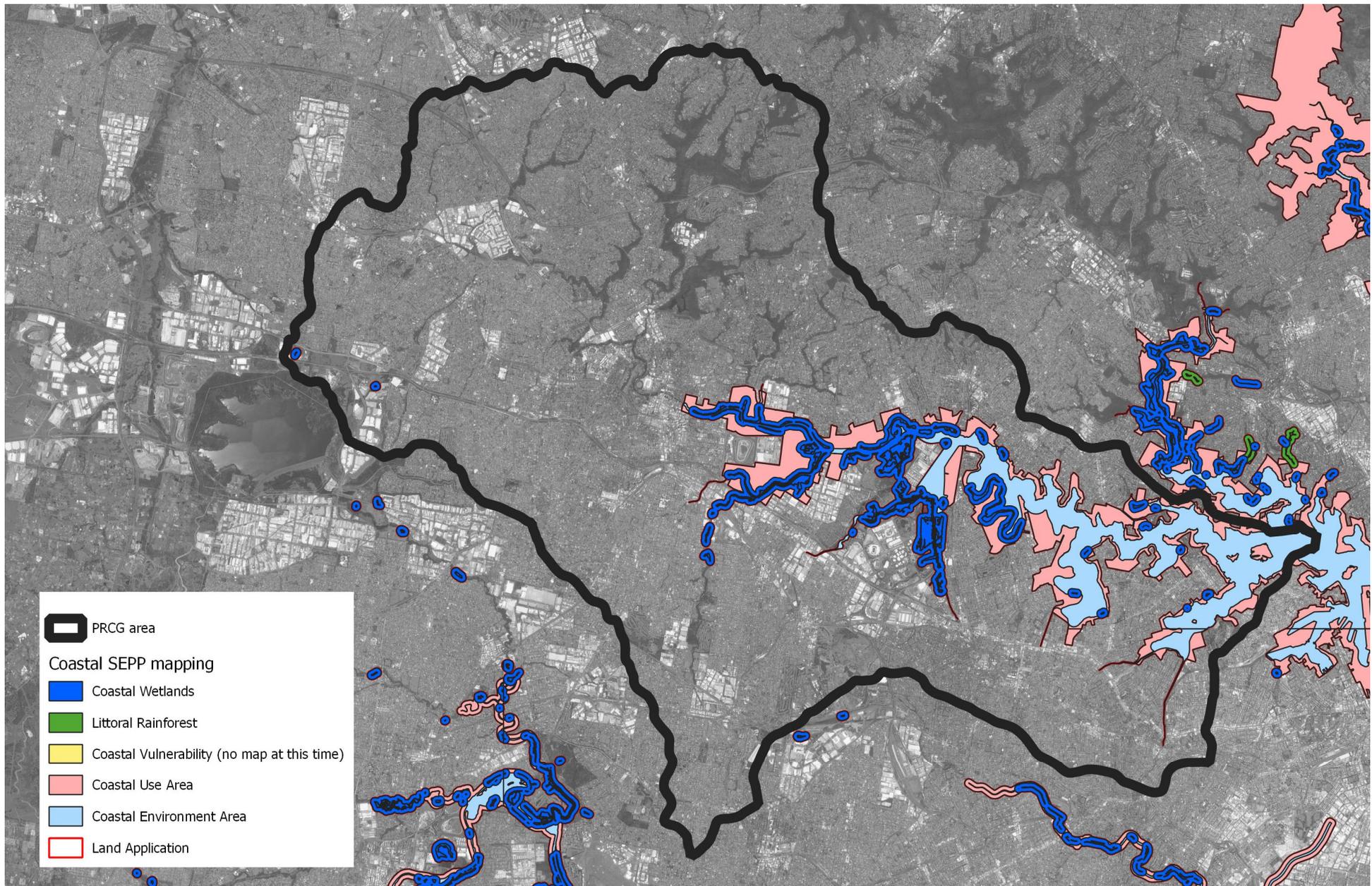


Figure 4: Coastal Management SEPP map layers for the Parramatta River catchment

2.1.3 Coastal Management Planning

The Coastal Management Manual provides guidance to catchment managers on developing Coastal Management Programs (CMPs), and the Coastal and Estuary Grants Program provides funding assistance to help prepare and implement CMPs. A Greater Sydney Harbour Coastal Management Program has been proposed for Sydney Harbour, including Parramatta River. A scoping study has been prepared for the CMP (BMT WBM 2018).

There is a strong alignment between the work being undertaken by the PRCG and the proposed scope of the Greater Sydney Harbour CMP. The CMP has a broader scope, in terms of spatial scale, the stakeholders involved and the issues it intends to cover. However it should be informed by and should support the PRCG’s work on the Parramatta River in several ways. The scoping study (BMT WBM 2018) identifies four key opportunities from a Greater Sydney Harbour CMP, as shown in Table 1.

It is worth noting that the proposed scope of the Greater Sydney Harbour CMP includes the catchment of Sydney Harbour. While the focus of both the NSW Marine Estate Management Act 2014 and the NSW Coastal Management Act 2016 is the coastal zone, the CMP process recognises the connection between the marine estate/coastal zone and its catchment, and extends the planning to the catchment.

Table 1: Opportunities for a Greater Sydney Harbour CMP, and potential links with the Parramatta River Masterplan

Opportunities identified in the Greater Sydney Harbour CMP scoping study (BMT WBM, 2018, p. iii)	Potential links with the Parramatta River Masterplan
Potential to establish a clear governance framework for managing Greater Sydney Harbour	Governance has also emerged as an important issue in the Parramatta River Masterplan, and a revised collaborative governance framework is now being implemented, with clearer leadership (particularly by Sydney Water, as lead agency for Masterplan implementation) and more engagement with Aboriginal leaders. There is potential for the CMP to build on these governance reforms.
Potential to secure significant funding to undertake planning and implement action (e.g. State and Federal Government, business) if the benefits of a coordinated and strategic plan are well articulated	There is potential for some of this funding to flow to the Parramatta River catchment, for projects that support both the CMP and the Parramatta River Masterplan.
Opportunity to develop a strategic and integrated long-term plan that can address the system-wide opportunities and threats, while also addressing local issues	In order to develop this plan, the CMP will involve further survey, study and modelling of the Harbour ecosystem and infrastructure. This can potentially assist with the planning and design of each of the Parramatta River Masterplan actions.
Opportunity to dovetail with parallel planning process and management strategies underway (e.g. Greater Sydney Region Plan and District Plans; draft NSW Marine Estate Management Strategy).	There is the same opportunity for the Parramatta River Masterplan.

2.2 NSW planning system

The NSW EP&A Act is the major piece of legislation governing the planning system in NSW. The NSW EP&A Act underwent a major update in 2017, and some of the important features of this update have included:

- There is an emphasis on “good design and amenity of the built environment”, as one of three new objects of the Act
- There is an emphasis on strategic planning, recognising the critical role of councils in strategic planning for their local area. The Act requires the preparation of new Local Strategic Planning Statements (LSPSs) for each local government area. These take their place as a key strategic link between regional and local plans, as shown in Figure 5. LSPSs are expected to improve ‘line-of-sight’ between regional and local planning (NSW Government 2018a).
- Councils are being asked to keep their LEPs and DCPs up to date and “as simple as possible”. A standard DCP format is being developed to improve consistency across local councils and make it quicker and easier for people to navigate the planning system and its controls
- There are new provisions for voluntary planning agreements, and in high growth areas (such as the Greater Parramatta Olympic Park (GPOP) corridor), DPIE is preparing special infrastructure contribution determinations

Another feature of recent planning reforms includes a consolidation of State Environmental Planning Policies (SEPPs) – for example, the draft Environment SEPP proposes to replace eight existing instruments including the Sydney Harbour Regional Environment Plan (REP).

To support the focus on good design, the NSW Government Architect’s Greener Places draft policy (2017) provides a set of principles and guidance to support productivity, environmental management and liveability through good design. It aims to support green infrastructure with an expectation that this will be integrated with urban development and grey infrastructure, connected into a network of open space, deliver multiple ecosystem services and involve the participation of stakeholders in development and implementation.

The NSW Government Architect has also published a guide to the Green Grid and series of Green Grid plans for each of Sydney’s districts. These promote the creation of a network of high quality open spaces that support recreation, biodiversity and waterway health (Tyrell Studio 2017).

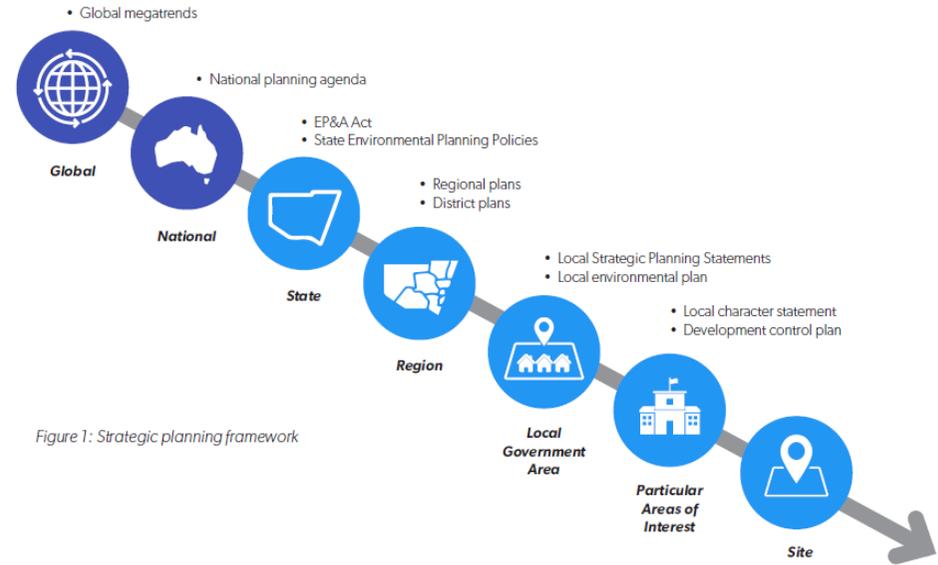


Figure 1: Strategic planning framework

Figure 5: NSW Strategic planning framework (Greater Sydney Commission 2018e)

2.3 Metropolitan and district plans

An important trend in Sydney (and other Australian cities) over recent decades has been the transition from majority greenfield development towards more infill development, and associated increases in population densities within established urban areas. Figure 6 shows the change in population density with distance from the Sydney city centre, from the 1980s to the 2000s. In the 1980s, the biggest increase in population density was in what was at that time the expanding urban fringe of Sydney. In the 1990s, population density increased across all of Sydney’s inner and middle rings. During the 2000s there has been solid continued population density increase in the inner rings.

The latest metropolitan plan reinforces this trend, planning for an increasing population, and aiming to house that population largely within the established urban area, including a significant amount of growth planned within the Parramatta River catchment. New development is planned around centres, along transport corridors and in urban renewal areas where density can be increased.

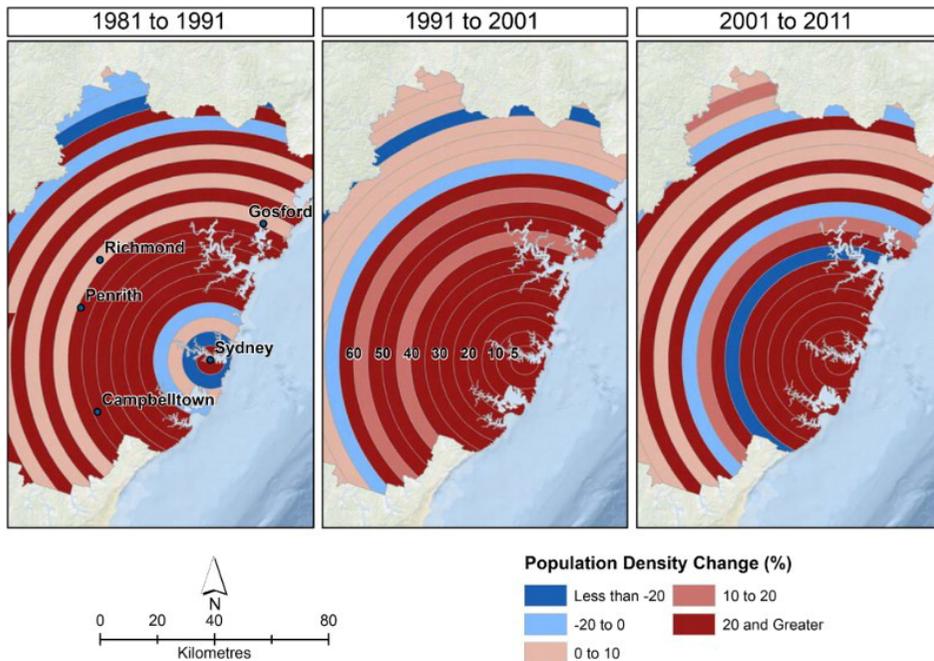


Figure 6: Population density changes in Sydney from the 1980s to the 2000s (Coffee et al, 2016)

Figure 7 shows the expected increase in the number of dwellings between 2016 and 2041, in those local government areas that overlap with the Parramatta River catchment. Not all of this growth will be in the Parramatta River catchment.

Figure 8 shows the district-level land use and infrastructure plans for the Parramatta River catchment, based on the structure plans in each of the District Plans (Greater Sydney Commission 2018b, 2018c and 2018d). The metropolitan and district plans propose a large amount of new development into the Parramatta River catchment, particularly in the GPOP corridor. This is shown in Figure 8, which shows the GPOP corridor as an economic corridor, as well as other development areas focused on centres, transit-oriented development and urban renewal areas.

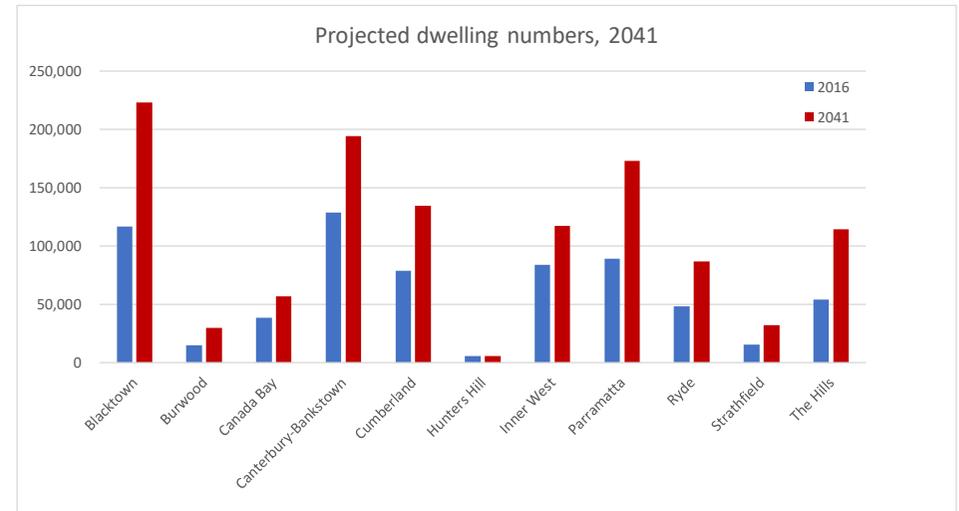


Figure 7: 2016 dwelling numbers and 2041 dwelling projections for LGAs with area in the Parramatta River catchment (NSW Government 2019)

As population densities increase, there is a focus on improving liveability within growth and renewal areas, by investing in infrastructure, including green infrastructure, to support this growth. One of the key directions of A Metropolis of Three Cities (Greater Sydney Commission 2018a) is “Valuing green spaces and landscape”. Under this theme, the Greater Sydney Commission (GSC) acknowledges the importance of Sydney’s coast and waterways, particularly under Objective 25 – “The coast and waterways are protected and healthier” (GSC, 2018a). Specifically, it notes, “Lake Parramatta, a popular swimming destination and the Parramatta River provide a setting for foreshore and water-based recreation that helps define the Central River City” (GSC, 2018a). This acknowledges the importance of the Parramatta River as a focal point for recreation.

The GSC goes on to state that “Improving the health of waterways is essential to the sustainability and liveability of Greater Sydney” (GSC, 2018a, p.149), discussing how an integrated approach to managing green infrastructure, including strategic alignment of science, urban design, land management and planning frameworks, would help achieve the inter-related goals of healthy waterways to support aquatic ecosystems, biodiversity, recreation, liveability and economic productivity. The GSC also states that waterway protection for aquatic ecosystems and cooler greener environments are critical to support at the strategic planning, development control and management perspectives.

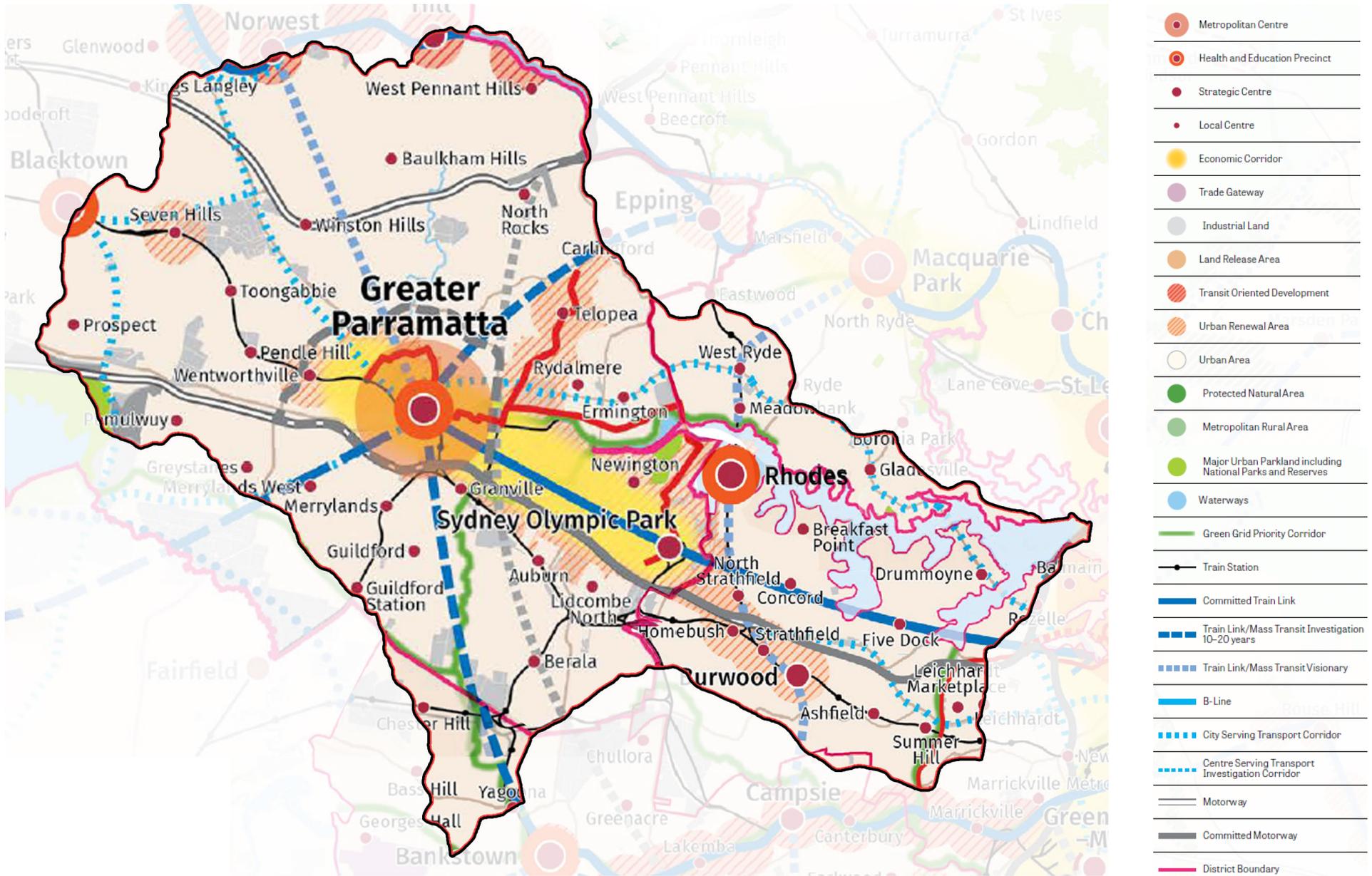


Figure 8: District-level land use and infrastructure plans for the Parramatta River catchment (Greater Sydney Commission 2018b, c, d)

The strategies proposed under Objective 25 “The coast and waterways are protected and healthier” are to:

- Protect environmentally sensitive areas of waterways and the coastal environment area
- Enhance sustainability and liveability by improving and managing access to waterways, foreshores and the coast for recreation, tourism, cultural events and water-based transport
- Improve the health of catchments and waterways through a risk-based approach to managing the cumulative impacts of development including coordinated monitoring of outcomes
- Reinstate more natural conditions in highly modified urban waterways

These strategies are well aligned with the Parramatta River Masterplan, and the Parramatta River Masterplan is referenced in the Central, Eastern and Northern District Plans (Greater Sydney Commission 2018b, 2018c and 2018d), which cover the majority of the Parramatta River catchment.

New development can be seen as both a risk to healthy waterways, as well as an opportunity to do things differently and improve waterway health. The central River City Vision from the GSC notes that large urban renewal projects provide the opportunity to improve sustainability through a precinct-based planning approach (GSC 2018b).

2.4 Local Planning

At a local government level, catchment councils’ community strategic plans support the mission of the PRCG with many progressing towards swim or water-based recreation sites along the Parramatta River. Further, in partnership with the state planning agencies, councils are currently finalising their local strategic planning statements that are designed to bring together, more closely, the outcomes expected from metropolitan and district plans, with local planning and the supporting infrastructure. e.g. City of Parramatta (2019) and City of Ryde (2019).

2.5 Current WSUD policy

Water sensitive urban design (WSUD) has been posited as a planning, policy and practice solution to improve water quality and riparian ecosystem health. This has been used to support the introduction of various forms of WSUD controls as part of councils’ planning strategies and within their DCPs. WSUD is typically presented as an integrated approach to achieve multiple objectives of sustainable water cycle

management and integrate these with the urban design and built form, to protect aquatic ecosystems and achieve healthy waterways. It speaks to broader water and biodiversity outcomes, as shown in Figure 9.

However in NSW, WSUD policy is fragmented, with different state agencies and local government administering different policies for different aspects of WSUD:

- Water conservation is the focus of the BASIX SEPP, however it only applies to residential development. Local council DCPs often include water conservation provisions for non-residential development, and some set targets for specific situations that are higher than the current BASIX targets
- Water supply and wastewater management are planned and regulated by State Government. Sydney Water is the major operator of water supply and wastewater systems in the metropolitan area, however a few small schemes are privately operated. Local government has assumed a minor role undertaking stormwater harvesting mainly to supply their own uses (e.g. for irrigation of sports fields).
- Waterways themselves and their riparian zones are protected under the NSW Water Management Act. Some local councils include riparian land provisions in their LEPs, however the Water Management Act would take precedence in the case of any inconsistency.
- Waterways within the coastal zone, including the tidal part of Parramatta River, are also protected under the Coastal Management Act (2016) and the Coastal Management SEPP (2018). These instruments apply to lands surrounding coastal waterways.
- Stormwater quality is largely left to local provisions in LEPs and DCPs. Typically, LEP statements are framed as general outcomes, e.g. cleaner waterways. DCP controls are typically performance targets, presented as percentage reductions in the mean annual load of common stormwater pollutants including total suspended solids (TSS), total phosphorus (TP) total nitrogen (TN), and gross pollutants.
- DCPs also often include provisions to protect bushland and biodiversity, and landscaping provisions such as setbacks, minimum landscaped areas and minimum deep soil areas, however these are typically found in separate sections of the DCP and not aligned with WSUD controls.

The CRC for Water Sensitive Cities has reviewed and compared policy frameworks for WSUD across Australia, including in NSW. Choi and McIlrath (2017) found that “Planning policy to support WSUD is not yet supported in the NSW planning system to the same extent as elsewhere in Australia” (p.69). They observed that:

- State Government policy provides high-level support for WSUD, but limited guidance for the preparation of development applications at a local level. Several State Environmental Planning Policies include WSUD principles, but no more detailed objectives or targets
- “NSW does not have a clearly legislated policy on urban stormwater quality and flow objectives” (p.70). There are pollutant load reduction targets included in some regional plans (including including the Sydney Harbour Catchment Water Quality Improvement Plan) but these rely on implementation via local Development Control Plans
- While there are some WSUD provisions for Growth Centres, “there are no planning controls for WSUD that apply to infill developments across the state” (p.72)
- At the individual lot scale, the Exempt and Complying Development Code does not include WSUD objectives
- “A limited range of implementation guidelines are available in NSW” (p.74)

Choi and McIlrath (2017) identify reform priorities for NSW as:

- A clearly mandated state planning policy for WSUD
- Mandatory stormwater runoff quality and flow targets
- Policy support for small to medium infill developments was identified as a particular need
- A regulatory framework addressing funding for WSUD in the public realm
- Implementation guidance including design guidelines
- Better integration of natural resource management and catchment planning into the planning system

These recommendations are closely aligned with the actions identified as part of Step 4 in the Parramatta River Masterplan.

A 2018 CRC for Water Sensitive Cities publication, the “Vision and Transition Strategy for a Water Sensitive Greater Sydney” articulates a vision for Sydney as a water sensitive city, benchmarks the city’s current performance and looks at how to advance the transition to a water sensitive city. The report recommends five over-arching strategies to advance Sydney’s transition to a water sensitive city:

- I. Create formal and informal networks for driving Sydney’s water sensitive city agenda to support a collaborative, flexible and integrated governance approach.
- II. Embed Sydney’s water sensitive city vision in organisational policies, plans and strategies.

- III. Establish a cross-organisational framework that enables and drives an integrated and strategic approach for managing the whole water cycle.
- IV. Increase knowledge about the social, technical and design solutions that are not yet sufficiently developed to deliver the full scope of Sydney’s water sensitive city vision.
- V. Identify and establish pathways for implementing water sensitive solutions through innovation and investment.

These strategies describe activities the PRCG is already undertaking and/or the steps in the 2018 Parramatta River Masterplan. While the recommendations in the CRC document are generally aligned with those in the Masterplan, they are quite broad provide no more detail on the way forward.



Figure 9: A vision of a water sensitive city, developed for the WA Department of Water and Environmental Regulation (DWER) by Emerge Associates, 2018

2.6 Why we need to improve stormwater and waterway management

There are synergies between the mission of the PRCG and the strategic intent of many State agencies and councils. There is clearly an intention for policy and strategic coordination and integration within and between levels of government. This is mirrored in the Parramatta River Masterplan. While its focus is to bring back swimming, it also has the aspiration for a healthy living Parramatta River. This is where it links to broader liveability objectives inclusive of a greener canopy, a connected green and blue grid, supporting passive and active recreation and improving urban ecology outcomes. It's not just about water quality but providing a liveable, sustainable and productive city.

However, despite WSUD and other complementary landscaping planning provisions being in place in many local government DCPs for many years now, the outcomes, such as cleaner waterways, are still falling short. There are many reasons for this, including:

- A lack of consistent and outcome focused policies across the catchment
- Multiple agencies and stakeholders with differing and often conflicting values, and a high degree of interconnectivity between stakeholders

- Fragmentation of WSUD policy is leading to fragmented outcomes. Separation of the 'blue' and 'green' elements reinforces a single disciplinary approach to development planning and design. WSUD implementation is often reduced to water quality treatment alone, with opportunities for other outcomes overlooked
- Despite general support for the goals of the Parramatta River Masterplan, there is a lack of widespread support for WSUD implementation within relevant organisations, particularly at management level

Herein lies the reality that urban stormwater is a complex problem. This is characterised by the fact that there is no single or linear solution that can address the various objectives. That is, it is a classic feature of environmental problems that they can't be "fixed." Framing options to address urban stormwater therefore need to recognise that coordinated and incremental approaches are needed, there must be learning by doing and that there is a need for state and local government policy consistency, particularly as to how future development is to be planned and delivered, so as not to undo or compete with an agreed mission to make the Parramatta River swimmable.

3 ISSUES AND OPPORTUNITIES

Improving diffuse stormwater pollution and waterway management is complex, but strong alignment between strategic goals provides an excellent platform to tackle the problem from a fresh angle

As discussed in Section 2, a key strength of the Parramatta River Masterplan is that it is strongly aligned with several key current State government policies, strategies and plans. There is alignment around the general principle of improving waterway health to support a sustainable, vibrant and liveable city. There is also alignment around methodological aspects – the principles of place-based and risk-based planning, and good design principles for green infrastructure that is integrated with urban development and grey infrastructure, connected into a network of open space, delivers multiple ecosystem services and involves the participation of stakeholders in development and implementation. Current revisions to local planning provisions are therefore an important opportunity to encourage the best possible outcomes from new development, through stronger provisions that are better aligned with the Parramatta River Masterplan.

Table 2 identifies nine key issues associated with new development in the Parramatta River catchment, explaining the risks and opportunities for improvement. These issues have been identified both in the development of the Parramatta River Masterplan and in the first “Standardise the Standards” workshop in August 2019. They build on the points raised in Section 2.6, being more specific about particular aspects of the problem.

It is worth noting that the same issues are being raised elsewhere around Australia, as WSUD practice reaches a similar level of maturity in other places, and other states are also revising their planning systems in line with place-based approaches, also aligning their goals with a liveability agenda and also encouraging more well-designed green infrastructure to be integrated in the urban environment. Examples from other states are mentioned throughout Table 2, but Victoria’s ideas are worth particular mention,

as they align closely with the issues raised in this discussion paper. Victoria’s experience is highlighted in Box 1.

Summarising the key themes from Table 2, six opportunities to strengthen planning provisions in the Parramatta River catchment are to:

- Consider the fundamental drivers of waterway health and link provisions more strongly with **waterway health goals**. Focus on reducing and disconnecting impervious area, and reducing stormwater runoff.
- Bring planning instruments and development controls ‘**back to basics**’, setting up realistic requirements that are likely to succeed in the long-term
- Encourage **integrated**, multi-purpose **green infrastructure** in both the private and public domain, including streetscapes. Consider whether more codified or more flexible, performance-based methods are more appropriate in different types of development.
- Provide stronger protections for **riparian corridors**, including where waterways have been highly modified, and plan for restoration of riparian corridors
- **Plan for monitoring and review**. Consider how compliance will be checked at DA stage, as well as how outcomes will be checked both immediately after construction, and in the long-term. Consider how catchment-wide data will be aggregated for reporting and review purposes.
- Ensure that any planning instruments and development controls are supported in their implementation, including **sustainable funding** at an appropriate level.

These ideas are also summarised in Figure 10 and the following sections (3.1 to 3.5) expand on each one.

Box 1: Victoria's Improving Stormwater Management Advisory Committee

The Victorian Government recently convened an advisory committee focused on improving stormwater management, including highly respected members from WSUD, planning and urban development backgrounds. The committee has published two key reports – an issues paper (Victoria DELWP, 2018a) and a final report (Victoria DELWP 2018b) giving their recommendations.

The issues paper identifies six key opportunities, which are all familiar in the NSW context – opportunities to:

- Extend the coverage of stormwater planning requirements, including a more consistent approach to local policies
- Provide broader benefits, including benefits related to liveability and green infrastructure
- Deliver a 'place-based' approach, where WSUD provisions are tailored to local conditions
- Link water management and urban planning, including better integration at strategic planning stages
- Improve compliance and implementation, including tools to support both public and private domain WSUD
- Support stormwater management in the public realm, with both decision support and appropriate funding

Some recommendations in the final report are specific to the Victorian context; those more relevant to NSW include:

- More effective arrangements for voluntary stormwater quality offset schemes, to enable local government and others to provide cost-effective stormwater solutions with statewide and local benefits
- Strengthen compliance requirements, including obligations on land and infrastructure (such as roads) managers
- Determine funding sources for public stormwater infrastructure, including funds for management and maintenance
- Set stronger, place-based stormwater performance objectives to protect the health of sensitive waterways and bays, enhance amenity and recreational values and reduce flooding
- Strengthen the enforcement of stormwater construction requirements (construction site management)
- Improve tools and guidance, including deemed-to-satisfy solutions and modelling tools

Broaden building and development rating systems to include integrated water management

Table 2: Issues and opportunities for improvement

Issues	Current situation	Opportunities for improvement
 <p>Significant new development is planned in the Parramatta River catchment</p>	<p>New development presents a risk to water quality both during the construction phase and in the long-term. Significant new development is planned in the Parramatta River catchment, as shown in Figure 8. This will involve the conversion of former industrial areas to residential and mixed-use development, intensifying the density of existing residential land and ongoing and incremental development as part of the urban renewal process.</p> <p>As a whole this development is expected to increase the impervious area of the catchment by 5% by 2025 (Sydney Water 2018).</p> <p>Where industrial sites are redeveloped as mixed-use development, there may be a net reduction in impervious area on a lot basis but this will be subject to how the site is remediated and developed.</p>	<p>New development is a key opportunity to incorporate structural and non-structural measures to reduce stormwater runoff (volume) and pollutant loads. This can occur at a lot, precinct and catchment scale.</p> <p>Planning controls and subsequent maintenance of structures should consider opportunities to maximise benefits reflecting on scale, location and capacity for perpetual upkeep.</p>
 <p>Current planning provisions provide little incentive to reduce impervious area or runoff quantities</p>	<p>One of the best ways to reduce pollutant loads entering the Parramatta River and its tributaries is to reduce the quantity of stormwater runoff. In developing the Parramatta River Masterplan, the modelling study showed the benefits of reducing impervious area: “The modelling demonstrates that diffuse sources and large areas of imperviousness are the main contributors to current high Enterococci loads... The results of the modelling framework demonstrate that policies directed to reducing imperviousness such as permeable paving or increasing infiltration, such as on-site raingardens, would be of benefit to mitigating Enterococci loads.” (Sydney Water 2018, page 85).</p> <p>However current targets provide little incentive to reduce impervious area or reduce runoff:</p> <ul style="list-style-type: none"> • Pollutant load reduction targets (% removal of TSS/TP/TN) can be met without reducing runoff. In fact, it is somewhat easier to meet pollutant load reduction targets if the developed site has a higher impervious fraction, as it raises the baseline load. • Peak flow reduction targets (e.g. OSD requirements) can also be met without reducing runoff quantities • There are development controls that encourage the use of rainwater tanks (e.g. BASIX) and rainwater harvesting reduces runoff, however the incentives for rainwater harvesting could be strengthened (see below) <p>High proportions of directly connected impervious areas remain the norm in new development.</p>	<p>Runoff quantity controls (i.e. (volumetric reduction) have been implemented in some jurisdictions and can be a relatively straightforward requirement.</p> <p>Opportunities exist to increase infiltration at a lot, precinct (e.g. Sydney Olympic Park) and linear (street verge) perspective.</p> <p>Site-based volumetric controls are used by Sydney Olympic Park Authority. The Authority requires a 10% reduction in the mean annual runoff volume from new development sites as part of their Stormwater Management and WSUD Policy (2016).</p> <p>At a lot scale, impervious area controls are an option. These must, however, consider incremental development within individual lots that are not captured by current approval processes (e.g. paving).</p> <p>Systems that provide financial incentives for either developers or land owners to reduce impervious area should be considered.</p>

Issues	Current situation	Opportunities for improvement
 <p>Rainwater harvesting has become more mainstream, and current requirements could be significantly strengthened</p>	<p>BASIX was introduced in 2004, setting a 40% target for reduction in mains (potable) water use in new development. It has encouraged installation of water efficient fittings and rainwater tanks in new residential development and renovations. However:</p> <ul style="list-style-type: none"> • BASIX does not apply to commercial or industrial development (only residential) • As a performance-based policy, there is no mandatory control, such as requiring the installation of rain tanks that can serve to improve water quality and flow outcomes. • In multi-unit development, water-efficient appliances (dishwashers and washing machines) can count towards the 40% target, that means no direct incentive to undertake site-based rainwater harvesting to reduce overall site discharge (the target can easily be met with efficient fittings and appliances alone) • Baseline water use has reduced substantially since 2004, and the target could now be strengthened (not least as an ongoing drought response measure) • While rainwater tanks are often installed in new detached dwellings, they could work 'harder' if they were connected to more end uses. In 2011, NSW Planning found that 84% of new BASIX homes included an alternative water supply, and that of those homes, 94% used alternative water for garden irrigation, 73% for toilet flushing and 60% for laundries. Hot water connections were not reported. 	<p>Rainwater harvesting could be an important strategy to reduce runoff. More rainwater harvesting could be encouraged through an update to BASIX or via other planning provisions. Key opportunities are:</p> <ul style="list-style-type: none"> • Connecting residential rainwater tanks to more end uses • Incentives to increase the size of rainwater tanks • Encouraging rainwater harvesting in multi-unit and commercial development • Designing rainwater tanks to achieve greater volumetric reduction in runoff – e.g. “leaky” rainwater tanks with additional airspace and a slow-flowing outlet to an infiltration zone • “Smart” rainwater tanks could also be designed to meet multiple objectives (mains water reduction, runoff reduction, peak flow reduction) with more efficient use of the tank volume • Advocate for a trial of higher BASIX targets in the Parramatta River catchment, recognising the Parramatta River Catchment Group mission for a swimmable river and the scale of new development proposed (noting that this would be consistent with its promotion in the Metropolitan Water Plan (NSW Government 2017b) and by the Greater Sydney Commission) <p>The role of recycled water also needs to be considered within BASIX or similar instruments. This would complement the Water Smart Cities initiative identified in the Metropolitan Water Plan for Sydney (NSW Government 2017b).</p>

Issues	Current situation	Opportunities for improvement
 <p>Developers want certainty and assessment staff want objective based controls, but this often leads to a minimum least costs standard or outcome.</p>	<p>The broad principles of WSUD may be included in planning instruments and DCPs, but quantitative targets provide something tangible against which a development proposal can be assessed objectively, therefore they tend to become the focus of development assessment.</p> <p>Developers are looking for solutions which meet the targets as efficiently as possible (in the least space, at the lowest cost). These solutions typically lack broader environmental benefits (beyond water quality treatment).</p> <p>Performance based controls can support innovative solutions to achieve policy objectives. These however need to consider lot size, future management, location and condition of the catchment/sub-catchment.</p>	<p>To encourage solutions that have long-term effectiveness (beyond modelled performance), preferred 'standard modular' or 'deemed to comply' solutions should be recommended in support of performance-based solutions.</p> <p>Offset or site based tradeable solutions should be examined where sites have limited capacity or where sub-regional solution may offer greater overall catchment outcomes. A stormwater quality offset scheme has been established in Blacktown LGA as well as an increasing number of Victorian LGAs.</p>
 <p>There is little incentive for approaches that integrate WSUD into the landscape (the blue-green controls)</p>	<p>We are failing to encourage solutions that better integrate stormwater treatment into the landscape, provide habitat, improve microclimate or provide other less tangible benefits.</p> <p>Landscape and stormwater provisions tend to be presented separately in planning and development controls and seen as two separate sets of requirements. On the developer's side, separate consultant teams are likely to look at each set of controls independently, and within councils, development assessment may involve different staff from different teams. Opportunities for integration are missed.</p>	<p>If we want to encourage solutions that meet a broader range of objectives, we need to provide appropriate incentives.</p> <p>Potential approaches are either more codified solutions (e.g. minimum requirements for pervious area, deep soil planting, other landscaping, etc.) or more flexible methods that value a wider range of outcomes (e.g. the Healthy Waterways Initiative "Living Waterways Framework" in Queensland, which values broader outcomes using a scoring system).</p>
 <p>We are missing opportunities in streetscapes</p>	<p>Road reserves are important spaces in cities, as they represent a significant proportion of public space, they have the potential to shape the character of a neighbourhood, and they have a strong influence on mobility and other aspects of liveability.</p> <p>Roads are also a significant source of pollutants, and therefore to improve stormwater quality from the catchment as a whole, it is important to manage road runoff.</p> <p>However, road reserves are also highly contested spaces, with many different uses and types of infrastructure to be accommodated within them. Water-sensitive streetscape design has proven challenging to implement well, and its maintenance needs have resulted in some internal resistance within organisations to new installations.</p>	<p>Consider appropriate WSUD for streets, and consider how planning instruments and development controls can support water sensitive streetscapes.</p> <p>Consider the role of street verges and front setbacks in supporting deep soil planting and treatment of water while concurrently enabling vegetation.</p> <p>Consider how streets function as part of the green grid.</p>

Issues	Current situation	Opportunities for improvement
 <p data-bbox="143 379 383 533">We are missing opportunities to improve waterways and their riparian zones</p>	<p data-bbox="409 209 1476 395">The Parramatta River Masterplan recognises the value of waterways and riparian zones, including all the smaller tributaries of the Parramatta River, for supporting a healthy ecosystem and realising the goal to “bring in nature”. One of the recommendations is to “Map and reference key habitat areas and priority corridors within regional strategic plans and Council LEPs in alignment with the NSW Government Architect’s Bushland and Waterways Guide.” (a guide with the same name has been released as a draft by Active Living NSW, but is not currently available).</p> <p data-bbox="409 424 1476 577">Currently, the NSW Water Management Act (2000) includes requirements to protect riparian zones around watercourses. It limits the works that can be undertaken within a certain distance of the top of bank, with the distance depending on the order of the stream. It provides a basic level of protection, but does not necessarily encourage riparian zone restoration or enhancement of riparian corridors.</p> <p data-bbox="409 604 1476 727">The NSW Coastal Management Act (2016) and Coastal Management SEPP (2018) also place controls on development within the coastal zone. These instruments are also supported by a Coastal and Estuary Grant Program to provide technical and financial support to local government to help manage the coastal zone.</p>	<p data-bbox="1503 209 2101 427">Waterways and riparian zones vary widely across the Parramatta River catchment, but while many of them are highly modified, remaining bushland in the catchment is concentrated around waterways. Therefore, habitat areas and priority corridors are likely to align with waterways and riparian zones in many cases.</p> <p data-bbox="1503 454 2101 577">Some examples exist (e.g. Ku-ring-gai LEP 2015) where local planning instruments have been used to build on and go beyond the requirements of the Water Management Act.</p> <p data-bbox="1503 604 2101 663">Investigate and encourage the use of low-maintenance WSUD options.</p>
 <p data-bbox="143 930 383 1214">Monitoring and compliance is a gap in current practice, and available evidence suggests that a lack of maintenance is compromising long-term outcomes</p>	<p data-bbox="409 759 1476 912">Demonstrating compliance with pollutant load reduction targets (% removal of TSS/TP/TN) at the development application (DA) stage generally relies on modelling, typically using MUSIC. While this leaves room for innovation, the approach has also proved problematic. In many councils, development assessment staff (and other technical staff to whom DA issues are referred) often report that they lack the capacity to review MUSIC models or modelling reports in sufficient detail.</p> <p data-bbox="409 940 1476 1158">Modelled outcomes are rarely confirmed after construction is complete. Post-construction inspections are lacking. Most models assume that the built system will be fully functional in perpetuity, but anecdotal evidence suggests that built outcomes are often falling short of this assumption. Even where councils are undertaking basic post-construction compliance checks, it is challenging to measure actual pollutant load removal in the field, due to the time and resources required. Pollutant load monitoring requires intensive sampling over dozens of rain events, and is rarely undertaken.</p> <p data-bbox="409 1185 1476 1276">Stormwater quality treatment systems all require maintenance if they are to meet their objectives in the long term. However public maintenance budgets are limited, and private landowners often lack the capacity or incentive to maintain private stormwater assets.</p> <p data-bbox="409 1303 1476 1394">Vegetated stormwater treatment systems are also prone to failure at the establishment stage. Establishment issues are often poorly rectified in the haste to hand assets over to future public or private owners, and this can lead to long-term problems.</p>	<p data-bbox="1503 759 2101 978">As the expression goes, “you get what you measure”. It’s important to be able to demonstrate that built outcomes are meeting their intended objectives. We need to test the validity of current and new approaches by measuring real outcomes. Good quality data contributes evidence to support ongoing or modified policy in the long-term.</p> <p data-bbox="1503 1005 2101 1190">We need to ensure that development controls are written in a way that facilitates straightforward assessment at DA stage and compliance checks at construction/post-construction stages. Also consider how long-term outcomes may be monitored to assess the overall effectiveness of the policy.</p> <p data-bbox="1503 1217 2101 1404">The practicality of establishment and maintenance needs more serious consideration up-front. We need to consider what’s realistic and appropriate in the context of the Parramatta River catchment, in public and private domains, and at different scales of development.</p>

Issues	Current situation	Opportunities for improvement
	These issues are even more pronounced in exempt and complying development.	
 <p data-bbox="143 419 383 576">Current funding models leave council maintenance budgets overstretched</p>	<p data-bbox="405 248 1480 341">Lack of funding for public domain maintenance encourages councils to push for WSUD measures in the private domain. However private landowners are just as (if not more) ill-equipped than the public sector to maintain stormwater treatment systems (Ardren 2019).</p> <p data-bbox="405 368 1480 491">For any new or modified planning instruments and development controls, it is important to consider how their requirements will be paid for. The development industry will absorb reasonable construction costs, however funding for operations and maintenance is a more significant challenge, whether WSUD measures are located in the public or private domain.</p> <p data-bbox="405 518 1480 576">Developers are sometimes asked to consider life cycle costs, but there is little real incentive for a developer to reduce long-term maintenance costs.</p>	<p data-bbox="1498 248 2101 341">Consider who is best placed to undertake long-term operations and maintenance, what are reasonable costs, and how these costs can be funded.</p> <p data-bbox="1498 368 2101 461">Consider WSUD options that minimise long-term costs, but all options involve some costs, which need to be taken into account.</p> <p data-bbox="1498 488 2101 545">Create incentives for developers to install WSUD systems with lower life cycle costs.</p> <p data-bbox="1498 572 2101 665">Consider regulation or incentives to ensure that WSUD systems are maintained effectively over their entire life cycle.</p>

CURRENT ISSUES



Significant new development is planned in the Parramatta River catchment



Current planning provisions provide little incentive to reduce impervious area or runoff quantities



Rainwater harvesting has become more mainstream; current requirements could be significantly strengthened



Developers want certainty and assessment staff want objective based controls, but this often leads to a minimum least costs standard or outcome



There is little incentive for approaches that integrate WSUD into the landscape (the blue-green controls)



We are missing opportunities in streetscapes



We are missing opportunities to improve waterways and their riparian zones



Monitoring and compliance is a gap in current practice



Current funding models leave council maintenance budgets over-stretched

OPPORTUNITIES TO STRENGTHEN PLANNING PROVISIONS

Create stronger links with waterway health goals

Get 'back to basics': set realistic requirements at different scales

Encourage integrated, multi-purpose green infrastructure

Provide for stronger protection and restoration of riparian corridors

Plan for monitoring and review

Support implementation, including sustainable funding

TO CREATE A LIVING RIVER



AN ENGAGED COMMUNITY
that loves and cares for their waterways.



CLEAN, CLEAR WATER
that is safe and supports life in the river.



BUSINESS OPPORTUNITIES
enabling thriving local businesses due to the river's popularity.



HEALTHY ECOSYSTEMS
in the river, the catchment and natural creeks.



EASE OF ACCESS
through improved public transport and connected cycleways and walkways.



QUALITY FACILITIES
for events, leisure, recreation and family fun.

Figure 10: Summary of current issues and opportunities to strengthen planning provisions in the Parramatta River catchment

3.1 Create stronger links with waterway health goals

The NSW Office of Environment and Heritage and the Environment Protection Authority have developed and apply a risk-based framework to support planning outcomes where waterway health is important (NSW Office of Environment and Heritage and the Environment Protection Authority 2017). The risk-based framework is a place-based approach, where specific local waterway values, uses and objectives that have been identified through community consultation and adopted by government are the basis for informing local design and implementation plans. Furthermore, a scientific approach is used to test different management options and understand the options that will best achieve the desired management responses.

The Parramatta River Masterplan has followed a risk-based approach. Its scoping and development has involved:

- A continual consideration between development, waterway health and the community's uses and values of waterways
- Stakeholder feedback and engagement at all steps
- An evidence-based approach
- Consistency with the ISO risk management standard
- An iterative, cyclical approach to achieve the best possible goal setting with risk accounted for the Parramatta River.

Based on this approach, two important ways that local planning provisions can be more clearly linked with the local objectives for the Parramatta River are:

- **Reference specific local places:** refer to the Parramatta River catchment, and important sites within it, in planning documents developed for each LGA. A recommendation in the Masterplan is to “incorporate swimming sites into relevant land use plans and instruments, including councils’ new LEPs, and reference these in city-wide strategic plans.” Another is to “identify and prioritise swim site activation locations in tributaries flowing into the Parramatta River using the swimming site activation framework and incorporate into LEPs and city-wide plans.”
- **Be informed by relevant evidence:** use the specialist studies developed as part of the Parramatta River Masterplan to inform the development of planning provisions. The most important paper in this respect is the water quality modelling study (Sydney Water, 2018), however two other studies are also relevant:
 - The ecological health project report (CT Environmental, 2016)
 - The swim site activation framework (McGregor Coxall, 2018)

These studies looked at the factors that have an effect on waterway health and the community's specific waterway health goals, including the goal of a swimmable river. Each of these studies investigated how various management actions could improve waterway health and/or “swimmability” outcomes and help meet the community's goals. Key recommendations from these studies, which are relevant to Standardising the Standards, are summarised in Table 3.

The recommendations of these studies need to be translated into standards that can be applied to new development. The NSW Government's risk-based framework (NSW Office of Environment and Heritage and The Environment Protection Authority 2017), shown in Figure 11, describes the process by which this should occur.

The first step in the risk-based framework is establishing the context. The Parramatta River Masterplan is the key document that establishes the context for the Parramatta River, including the community's expectations, values and uses of the River. It articulates a vision for the Parramatta River, based on community and stakeholder consultation. It identifies the community's goals for the Parramatta River, articulating the expected features of a living river. Standards for water management (e.g. for waterway protection, restoration and diffuse stormwater pollution) should recognise and reflect these goals.

Water management standards also need to recognise the sensitivity of individual waterways – i.e. how the specific waterway is likely to respond to environmental stresses and management actions. The risk assessment process (Steps 2-4 in Figure 11) is being used in the Parramatta River catchment to inform the development of appropriate standards. Studies completed during 2016-18 to support the Masterplan (including the water quality modelling study, the ecological health project and the swim site activation framework, as well as an initial Economic Impact Analysis) have provided a first pass through the risk assessment. This will inform an initial revision of standards. However as noted in Figure 11, the risk assessment is iterative and further work will need to continue on these steps.

The final step in the risk-based framework is design and implementation of management measures. The Masterplan identifies ten high-level management actions to implement the Masterplan, and Standardising the Standards is one of these (Step 4). The recommendations in the Masterplan now need to be developed into more specific design and implementation plans, and the current project will address this need for Step 4.

Table 3: Key relevant findings and recommendations from detailed studies

Water quality modelling study (Sydney Water 2018)	Ecological health project report (CT Environmental 2016)	Swim site activation framework (McGregor Coxall 2018)
<p>The focus of this study was improving the swimmability of the river by improving water quality.</p> <p>Enterococci was chosen as the key indicator for water quality in the River, as “this correlates to current primary recreation risk assessment frameworks and is the current preferred indicator in recreational water quality guidelines” (p.i).</p> <p>Various management scenarios were tested to reduce enterococci loads, modelling the expected effects on enterococci at potential swimming sites. The two main management measures tested for new development were rainwater tanks in private property (including various scenarios) and rain gardens to capture road runoff.</p> <p>While other measures were not tested in the model, the report advises that other policies directed to reducing imperviousness such as permeable paving, increasing infiltration and raingardens, would also be expected to be of benefit to mitigating Enterococci loads. The main mechanism by which rainwater tanks and rain gardens reduce enterococci loads is by reducing runoff, and therefore other measures that reduce runoff would be expected to achieve equivalent results.</p> <p>The report also suggests that establishment of urban riparian buffers could be another useful option to reduce enterococci loads, however this option was not modelled.</p>	<p>The focus of this project was on improving ecological health throughout the catchment, with links identified to improving swimmability.</p> <p>Improved standards for new development should help to achieve the following recommendations from this report:</p> <ul style="list-style-type: none"> • Protect areas of intertidal mudflat, saltmarsh and mangrove • Protect patches of native vegetation with dense riparian and gully vegetation • Protect mature trees, including hollow-bearing trees • Create off-line wetlands to provide habitat and improve water quality • Revegetate and regenerate riparian corridors and other bushland areas with dense understorey and canopy vegetation • Create artificial hollows and restand dead hollow-bearing trees • Create and expand habitat through the Sydney Green Grid 	<p>The focus of this study was on activating specific swimming sites along the Parramatta River.</p> <p>Where new development takes place in proximity to these swimming sites, several of the recommendations from the swim site activation framework could also be translated into improved standards for new development. For example:</p> <ul style="list-style-type: none"> • Improving pedestrian and cycle access to swimming sites • Improving parking in proximity to swimming sites • Utilising foreshore planning controls or property purchase to improve adjacent open space • Creating spaces for relevant small businesses (e.g. paddle hire) in proximity to swimming sites • Considering opportunities for rezoning adjacent land • Encourage foreshore activation in design of new developments

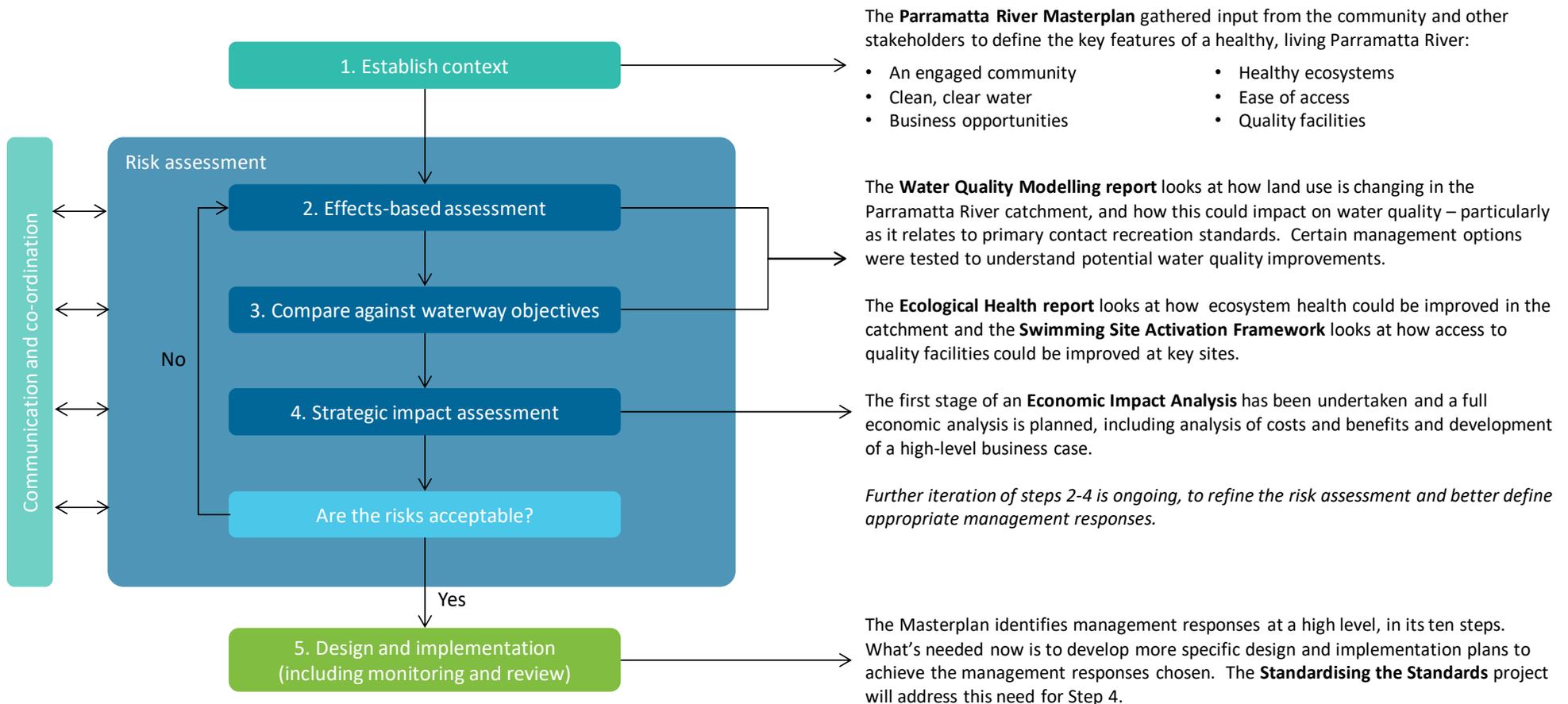


Figure 11: Application of the risk-based framework in the Parramatta River Masterplan

Figure 12 looks at what aspects of a living river can be progressed through new development (and therefore where standards for new development are important). As the focus of new development is physical infrastructure, it focuses on the physical aspects of a living river: clean clear water, healthy ecosystems and accessible swim sites with quality facilities. Each of these goals can be progressed via new development, and improved standards would encourage better outcomes. Other strategies (e.g. public domain retrofits) will also play a role, however:

- To reduce runoff, new development is crucial, and plays a more important role than public infrastructure. Every single development has an opportunity to

reduce runoff. Opportunities in the public domain are fewer, and the most important strategy to reduce runoff is to encourage this outcome in new development. The water quality modelling study (Sydney Water 2018) provides the rationale for this approach and the recommended actions by which it could be achieved.

- To improve habitat, new development and public investment both play a role. The ecological health project report (CT Environmental 2016) identifies many actions which could be undertaken by both developers and the public sector. The exact roles of new development/public investment will need to be

established for specific sites or waterways, so that the two work together to achieve integrated outcomes. Waterway/riparian corridors, where ownership is often fragmented, are a good example where a combination of well-planned redevelopment and strategic public investment can achieve better outcomes than either the public or private sector acting alone.

- Swim site access and activation opportunities highly site-specific and will often be more reliant on public investment than private development, though certain private developments, located at swim sites or involving a key access routes, could still play a role complementing public investment.

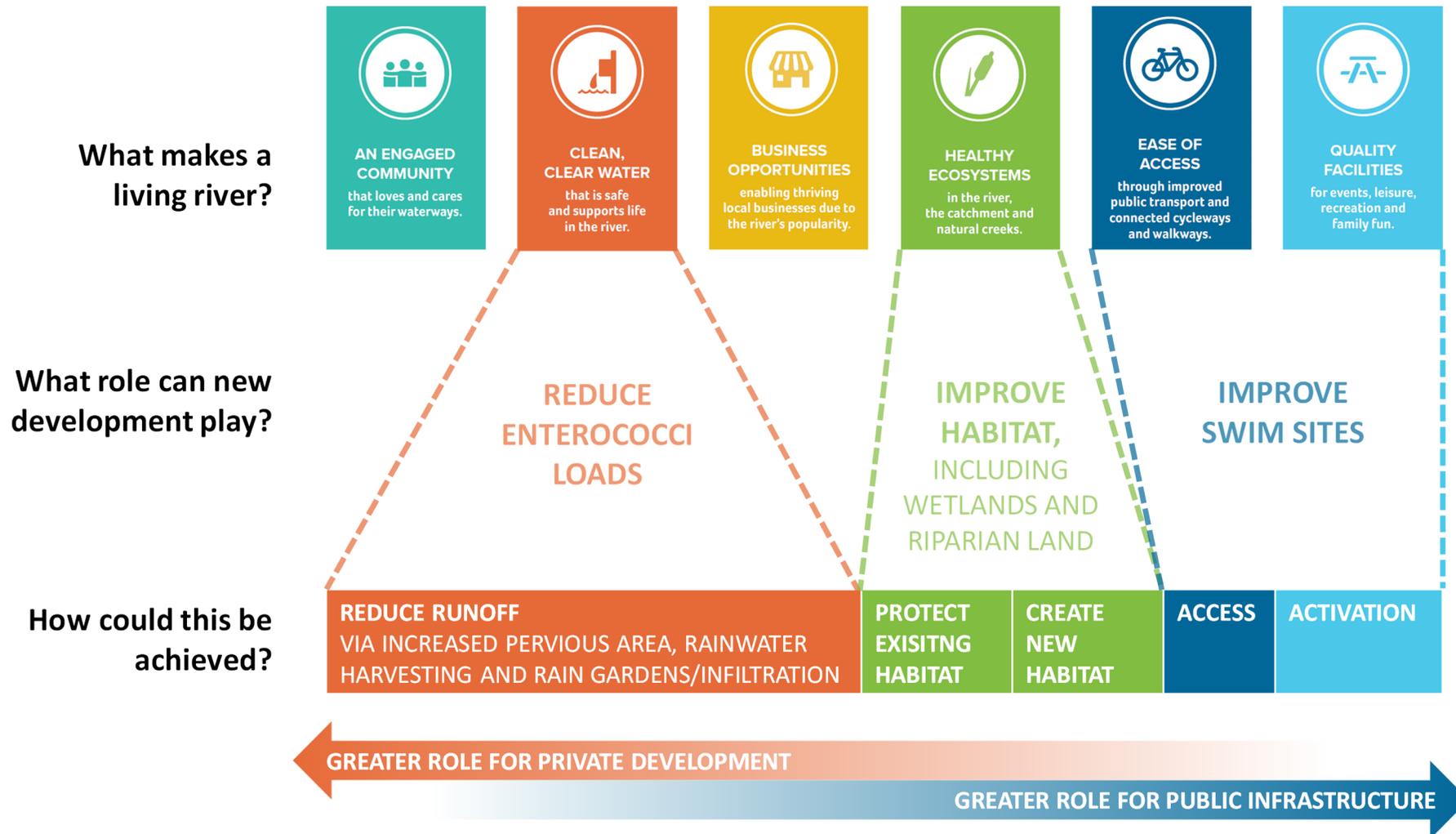


Figure 12: Roles for new development in contributing to a living river

Based on this a simplified, streamlined list of objectives has been generated for the Parramatta River, derived from the risk based framework and prioritising swimmability. Standardising planning controls for land and waterways in the Parramatta River catchment should aim to:

- Reduce enterococci bacteria entering the Parramatta River from stormwater
- Reduce chemical contaminants entering the Parramatta River from stormwater
- Reduce the amount of stormwater runoff entering the Parramatta River
- Increase landscaped area for the Parramatta River catchment and increase focus on Water Sensitive Urban Design
- Improve natural environment outcomes relating to waterways in the Parramatta River catchment

3.2 Get 'back to basics': set realistic requirements at different scales

Standards for new development need to be practical to implement – the industry needs methods to predict the effects of new development, modify designs or include management measures, and demonstrate compliance with standards at approval stage.

One of the challenges evident in the Parramatta River catchment and elsewhere around Australia is the challenge of integrating WSUD into infill development. It is the theme of CRC for Water Sensitive Cities project IRP4: Water sensitive outcomes for infill developments, which is currently underway. A decade ago, as WSUD was being codified in planning provisions, most of the Australian industry's experience and focus was still on greenfield development. WSUD provisions and supporting tools (e.g. technical guidelines) were developed for the greenfield context and refined to improve WSUD implementation in this context.

Recently, WSUD provisions have been applied to infill development at ever smaller scales. In this context, sites tend to be more constrained, densities are higher, and developers and their consultant teams are often smaller organisations with more limited capacity for design innovation.

WSUD standards that were originally written to encourage or require the installation of vegetated treatment systems (e.g. swales, wetlands and bioretention systems) in greenfield development are now being applied to smaller scale development where vegetated systems are harder to accommodate. While greenfield developers could install treatment systems in the public domain, infill developers often lack this option. Treatment systems need to be installed in the private domain, but their long-term

owners have limited capacity for ongoing operation and maintenance. Cartridge filters have become the preferred option for many developers to meet water quality (TSS, TP and TN) targets. Cartridge filters do not reduce runoff and there is limited information available on their effect on enterococci loads.

The way that WSUD standards were originally written also assumed that developers (or their consultants) would use the industry-standard water quality modelling tool MUSIC to demonstrate compliance with targets at the DA stage. This was more practical when approval authorities were dealing with fewer larger developments and where developers were supported by larger teams of specialist consultants. In smaller developments, the use of MUSIC has proven inconsistent and approval authorities lack the capacity for meaningful review of modelling results for a large number of small developments.

For WSUD provisions to succeed in the long-term, maintenance needs full and realistic consideration up-front. Currently, typical built systems are proving difficult to maintain, particularly when maintenance is distributed across many smaller treatment systems. This is true both:

- In the public domain, where council operation and maintenance budgets are constrained, and there are limited opportunities to seek extra funding for operation and maintenance costs
- In the private domain, where property owners are likely not even aware their maintenance obligations, let alone factoring this into their budget

Over the past 1-2 decades as WSUD has become more common in new development, we have tried to address the maintenance challenges by:

- Asking developers to consider life-cycle costs at the planning and design stages
- Providing technical guidance and training to the industry (including developers, consultants and contractors), to try to ensure that systems are well designed, well-built and well established before they are handed over to council or to private landowners
- Providing technical guidance, training and other support to WSUD asset owners (both to councils and more recently, in the case of Blacktown Council, to private WSUD asset owners as well) to try to ensure that operation and maintenance requirements are well understood.

None of these approaches has proven a wholly satisfactory solution. In many cases the problem has been shifted into the private domain, so that DCP requirements can be met without increasing public operation and maintenance costs, however the

available evidence suggests that private domain stormwater treatment systems are just as (if not more) problematic to maintain as those in the public domain.

Essentially there is a need to simplify WSUD requirements so that they are more practical and achievable, while still working towards the overall goal of bringing back swimming. There are several different ways to do this:

- Instead of asking small developers to design and install bespoke treatment systems to meet pollutant load reduction targets, “**deemed-to-comply**” or “**deemed-to-satisfy**” solutions typically simplify the requirements to more straightforward elements such as rainwater tanks. Deemed to comply solutions tend to be more prescriptive, and better suited to smaller-scale development.
- Some places use a **scoring system** and allocate points to a range of different WSUD measures, so there is some flexibility in the approach taken, but the approvals process is simplified. The Seattle Green Factor is one example that is quite straightforward; the BASIX tool is another example that has been shown to work well in NSW. This approach has the advantage that it can apply to a range of different scales of development, and can encourage a wide range of design options, shifting the emphasis onto reducing impervious area, retaining more water in the landscape and reducing runoff.
- **Simplified modelling tools** have been developed in several jurisdictions as an alternative to MUSIC that is more accessible to non-specialists (both to planning and design consultants and development assessors), provides less room for error, but still provides scope for flexibility in the approach to meeting stormwater quality targets. Examples include the S3QM tool in NSW (used by WaterNSW for development in the Sydney Drinking Water Catchment and by Blacktown Council) InSite Water in South Australia, and the STORM tool in Victoria.
- **Stormwater quality offsets** have been used in some jurisdictions (e.g. Blacktown LGA in NSW; Geelong, Kingston, Melbourne and Moonee Valley in Victoria) to simplify requirements at the lot scale, and enable construction of strategic regional infrastructure in the public domain. Offset mechanisms require up-front planning, and put the onus back on councils to undertake planning and design, but they can enable opportunities to invest in high value and high priority assets in the public domain, which can be designed to achieve multiple benefits.
- Consider **financial incentives/disincentives** as a mechanism to encourage better outcomes.

Box 2: Increasing use of stormwater quality offsets in Victoria

Melbourne Water has had a stormwater quality offsets scheme in place for many years, however it has always been presented as an option intended only when onsite stormwater treatment isn't practical or feasible.

However, a growing number of Victorian councils (including Geelong, Kingston, Melbourne and Moonee Valley so far) are now developing their own offset schemes, as they can see an opportunity to invest in public stormwater infrastructure that is relatively low-cost and adds value to public areas (Victoria DELWP 2018b).

The Victorian Improving Stormwater Management Advisory Committee recommended that “well-designed stormwater offsetting mechanisms can provide developers and councils with greater flexibility and can lead to more-effective and more-efficient stormwater management outcomes than on-site measures alone” (Victoria DELWP 2018b, p.33).

3.3 Encourage integrated, multi-purpose green infrastructure

As noted in Table 2, typical DCP controls for water sensitive urban design provide little incentive for approaches that reduce impervious area, reduce runoff or integrate WSUD into the landscape. However, these are fundamental principles of WSUD, with clear links to the goals of the Parramatta River Masterplan. Given the density of development and demands on public land in the Parramatta River catchment, planning provisions should be targeted at maximising multi-functional green and blue infrastructure to maximise land use efficiency.

There is potential to provide stronger incentives to encourage an integrated approach, while also meeting other related objectives. For example:

- Better use of rainwater tanks (e.g. larger tanks, connected to more roof area and more end uses) would reduce runoff and reduce water demands. Some NSW local council DCPs (e.g. Marrickville DCP 2011) already include provisions that encourage the use of rainwater tanks as a means to reduce runoff and contribute to achieving pollutant load reduction targets
- “Leaky tanks” are an emerging approach that could also increase infiltration and reduce flood impacts. For example, Jamali et al (2019) have shown the potential for leaky tanks to reduce peak flows in flood events in Melbourne
- There are various approaches to increasing the pervious area in new development. Examples of pervious areas we should value include:
 - Deep soils. Often required in new development, deep soils are important to support large trees, and could also be designed to retain more water in the landscape and encourage infiltration
 - Green roofs. Similarly, green roofs reduce impervious area and have the potential to retain more water in the landscape and reduce runoff
 - Well-designed setbacks, which include pervious areas, vegetation and deep soils, and have the potential for water retention and infiltration.
 - Any other pervious area that retains water, encourages infiltration but is not necessarily designed as a specific stormwater treatment device that can be modelled in MUSIC
- Streetscapes are often challenging zones due to the range of services and infrastructure to be accommodated within these spaces, as well as the maintenance burden on local government. However a significant proportion of stormwater runoff passes through streetscapes in between private properties and public drainage systems, and there are potentially opportunities to improve water management in streets. In some cases, impervious areas could

be reduced and pervious areas could be utilised more effectively for stormwater retention and filtration.

Our current approach to WSUD in new development doesn’t make it easy to value the contribution of pervious areas towards reducing runoff and encouraging infiltration. At the moment, the only areas that “count” towards meeting pollutant load reduction targets are those areas dedicated to stormwater treatment – e.g. wetlands and bioretention systems. In fact, the more impervious the developed lot, the easier it becomes to meet pollutant load reduction targets (as the baseline load will be higher). This suggests there is a disconnect between pollution reduction and infiltration outcomes. However complementary planning controls, which align with requirements for deep soils, setbacks and landscape area requirements, and encourage more green cover as well as water retention and infiltration, could be used to support both blue and green outcomes without being seen as an additional imposition on new development. When WSUD is integrated into the landscape, it also has the potential to provide other broader benefits, such as a cooler microclimate and more diverse habitat.

Box 3: Integrating WSUD and green infrastructure provisions in South Australia

South Australia is currently revising its planning and design code, and as part of this process, Water Sensitive SA has produced a discussion/position paper on green infrastructure and water sensitive urban design (Seed Consulting Services 2019).

WSUD and green infrastructure are deliberately considered together, recognising the synergies and combined benefits of the two.

The discussion paper contemplates the introduction of:

- Minimum required areas of uncovered deep soil zones for different sized developments
- A green cover scoring system
- A trading scheme for offsite green cover solutions
- An index that integrates green infrastructure, tree canopy and WSUD, and prioritises solutions that achieve all three
- Guidance material to encourage disconnection of impervious areas
- Incentives to retain mature trees
- An agreed approach for valuing trees and capturing the cost of trees removed for development in a tree fund
- Deemed-to-satisfy solutions for small development

3.4 Provide for stronger protection and restoration of riparian corridors

As noted in Table 2 above, existing riparian corridor provisions in the Water Management Act, 2000 (NSW) provide a basic level of protection for waterways and riparian corridors, by limiting the works that can be undertaken in the waterway and its riparian zone. The provisions apply to streams mapped in Figure 13, with the riparian width determined based on the Strahler stream order.

However somewhat like WSUD provisions, waterway and riparian corridor provisions have been written at a time when most development was in the greenfield context, and infill development is very different. In the Parramatta River catchment:

- Where waterways and riparian zones have been highly modified and degraded, protection is less relevant and it becomes more important to ask what could be improved. What are the appropriate objectives for these waterways, and how could positive actions be encouraged via the development process?
- Many of the waterways identified in Figure 13 are concrete channels, with little or no riparian vegetation remaining. In these cases where there is little left to protect, is there still potential value in improving the waterway corridor?
- In many places, private properties have been established and buildings constructed well within the riparian zone (as defined by the Act). In these cases where a strict interpretation would severely restrict redevelopment, what sort of compromises would be reasonable or worthwhile?

The concepts of stronger protection for riparian corridors, as well as requirements/incentives to limit piping of watercourses and improve riparian corridors, were discussed at the project workshop in August 2019, and there was a high level of interest and support among participants. Ku-ring-gai Council's LEP is a good example, which is discussed in Box 4.

The Ku-ring-gai Council method is a good precedent, which could be adapted to the Parramatta River catchment. One consideration in the Parramatta River catchment is that the fluvial geomorphology in the catchment is variable. Soils and geology vary substantially across the catchment. There exist different stream types and more highly modified streams that would impact on how the Ku-ring-gai riparian model is applied. Because of the degree of development and consequent impact on streams through piping or constructed channels, there are likely to exist more opportunities for rehabilitation and restoration of former watercourses.

Another factor to consider is the degree of public ownership of waterways and riparian corridors. Many riparian corridors in the Parramatta River catchment are located in public land, under the care and control of local government. However there are some waterways that pass through private properties, and others where there is only a narrow waterway corridor in public ownership, with much of the riparian zone on private land.

The application of any mapping and subsequent rehabilitation or restoration must consider how this may affect individual properties. This would need to include a review of easements and other utility affectations (as revealed through section 10.7 Planning Certificates). In Ku-ring-gai LGA, riparian land categories have been mapped on private property, but often on larger lots that because of slope or flooding risk would be considered undevelopable. If riparian areas are mapped on land otherwise considered developable, particularly if a substantial proportion of the lot is categorised as riparian land, this may trigger subsequent planning considerations such as acquisition or compensation. This would have financial impacts, but could be appropriate in development precincts where land use is substantially changing, or could be funded elsewhere as a strategic approach to advance the objectives of the Parramatta River Masterplan or other strategic plans.

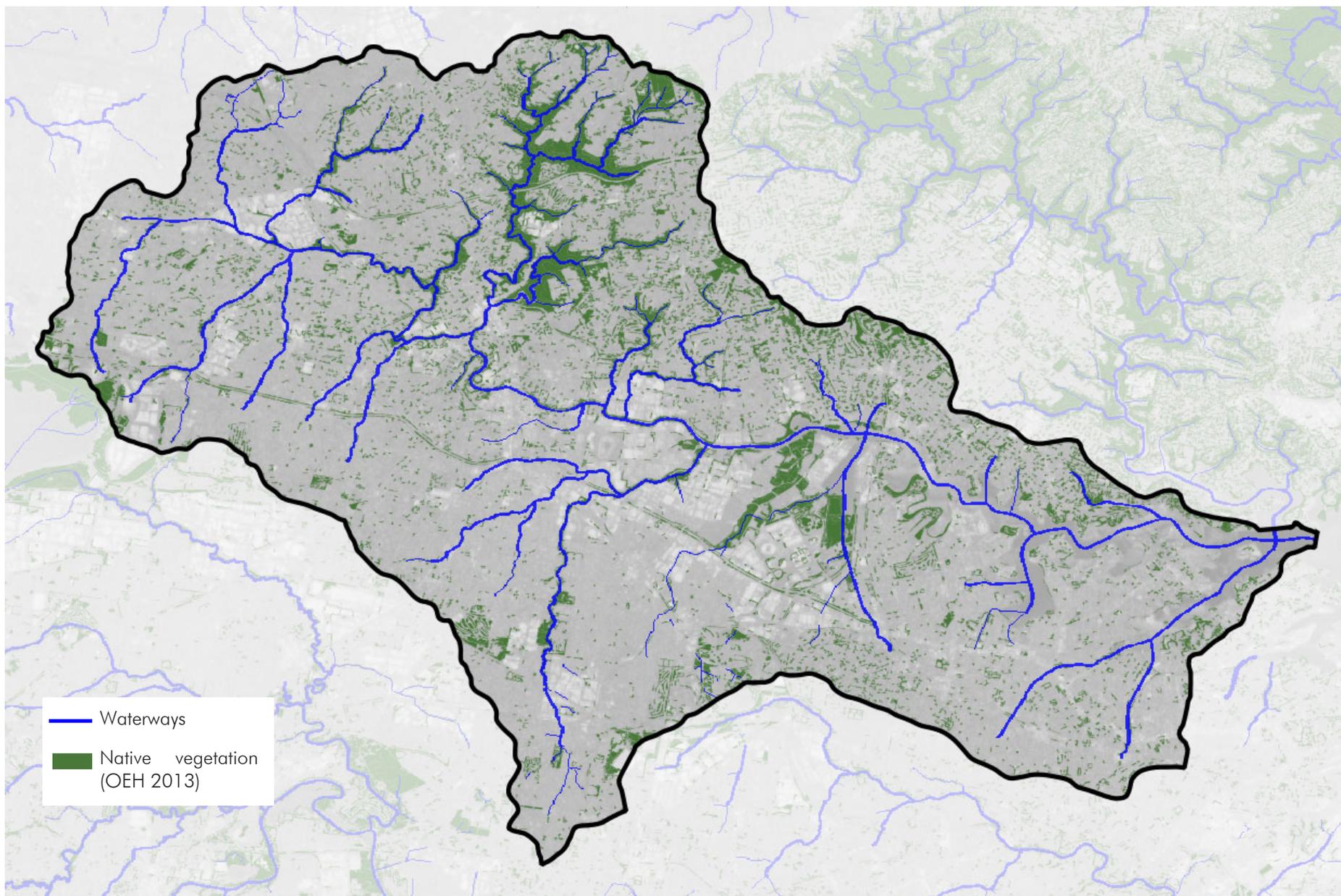


Figure 13: Waterways (as defined under the Water Management Act) and native vegetation in the Parramatta River catchment

Box 4: Ku-ring-gai's LEP provisions for riparian lands

Ku-ring-gai Council's existing LEP provides an example of how riparian lands can be protected with a local provision in the LEP and an additional mapping overlay. A key strength of the Ku-ring-gai LEP is that the riparian land categorisation aligns with the NSW Water Management Act, from which it also assesses the condition and recovery potential of the streams. Ku-ring-gai's LEP applies:

- The same categories for riparian lands
- A method of classifying and mapping riparian lands that is consistent with the Water Management Act (and was originally developed by the former NSW Department of Infrastructure, Planning and Natural Resources)

Ku-ring-gai's methodology is set out in their document "Ku-ring-gai Biodiversity & Riparian Lands Study Version 5" (Ku-ring-gai Council 2016). A sample of their mapping is shown in Figure 14, to give a sense of how riparian lands have been classified in Ku-ring-gai LGA. Note that riparian lands have been defined on private property, including land with residential, business and industrial zoning.

One of the key features of Ku-ring-gai's mapping (Figure 14) is that the mapping doesn't necessarily follow the Strahler stream order as the only determinant of the stream category. Another feature is a "Category 3a – watercourse restoration". This is an additional category beyond those defined in the Water Management Act 2000.

One of the key features of Ku-ring-gai's mapping (Figure 14) is that the mapping doesn't necessarily follow the Strahler stream order as the only determinant of the stream category. Another feature is a "Category 3a – watercourse restoration". This is an additional category beyond those defined in the Water Management Act 2000.



Category	Purpose
1	Environmental Corridor
2	Terrestrial and Aquatic Habitat
3	Bank Stability and Water Quality
3a	Watercourse Restoration

Figure 14: Sample of Ku-ring-gai Council's riparian mapping

3.5 Plan for monitoring and review

Monitoring and review are the focus of Step 2 (Keep Watch) and Step 9 (Report Back Regularly) in the Parramatta River Masterplan, but there are important connections with Standardising the Standards.

Monitoring and review are key features of best-practice policy – they are important to:

- Demonstrate progress towards overall goals
- Reveal any issues with policy implementation
- Adjust policy settings and make improvements

At the moment, it is difficult to measure the effectiveness of WSUD controls in existing planning provisions. There has been some reporting on BASIX outcomes, but the last NSW Government BASIX outcomes report (2011) is now eight years old. The effectiveness of stormwater quality treatment systems has been measured in some small and isolated studies, but not in a way that allows results to be aggregated for catchment-scale or LGA-scale reporting.

Part of the reason a gap exists is that field monitoring to measure load-based reductions in stormwater pollutants requires intensive monitoring over dozens of rain events, and it is rarely undertaken. However there is a need for detailed scientific investigations to be supported by routine monitoring programs that use simpler indicators to provide more timely feedback with greater geographic coverage.

It may be useful for the PRCG to develop a mechanism to monitor the impacts of developments on the waterways and creeks in a continuous and incremental manner, and new standards could be formulated in way that makes it easier to monitor their outcomes and review their effectiveness. Consider indicators that can be measured easily, using a repeatable method so that data can be readily aggregated across the Parramatta River catchment. Potential indicators could include impervious area, green cover, canopy cover, total stormwater flows and water quality indicators (e.g. enterococci concentrations in receiving waters).

Also worth considering are tools that enable detailed information on new development to be captured in a database. For example, all residential development that requires a BASIX certificate needs to use the same online tool, and information about that development is captured in the process.

3.6 Support implementation, including sustainable funding

To date, challenges with WSUD implementation have typically been addressed with additional guidance, training and other forms of technical and organisational capacity building for industry and government. However as the uptake of WSUD has increased, implementation challenges have also increased, and a lack of operations and maintenance funding has become a particularly prominent issue.

A lack of funding was recognised in a 2015 Australian Senate Inquiry into stormwater management, which recommended that the Australian Government work with the state and territory governments to develop and implement a national policy framework for stormwater management (a National Stormwater Initiative), and as part of this Initiative, “that the Australian, state and territory governments consider new funding models and financial incentives that would facilitate improved stormwater management outcomes in an economically efficient way”.

Local government in NSW is subject to ongoing cost shifting of services by higher tiers of government and having a limited capacity to determine their rating income that falls to the Independent Pricing and Regulatory Tribunal. With ongoing pressures to deliver more services and maintain infrastructure, local government has often shifted responsibilities to the private realm, such as managing stormwater quality and quantity at a lot basis, rather than designing and maintaining systems on public land. While this approach can relieve pressure on council resources, this decentralised approach has limitations, not least in lessening control over the quality of management of these systems and their combined contribution to achieve waterway health.

It is understood that the NSW Government has commissioned a study into funding options for diffuse stormwater pollution in NSW, but the outcomes of this study have not been made available.

One of the recent recommendations of the Victorian Improving Stormwater Management Advisory Committee (Victoria DELWP 2018b) is also focused on funding. They suggest the use of offsets, market incentives and service charges.

The NSW Stormwater Management Service Charge (the stormwater levy) is an existing mechanism that NSW councils can use to fund stormwater system operations and maintenance, however Bright (2018) found that:

- The stormwater levy can only cover a small proportion of councils’ total stormwater costs

- The levy has not been indexed to inflation, and therefore its effective value has reduced by approximately 25% since it was introduced in 2006
- A significant proportion of stormwater levy funds are being spent on capital works, with relatively little going towards operations and maintenance

Offset schemes (as raised in Section 1.1) offer a potential funding mechanism, but in some existing examples (e.g. Blacktown LGA), the revenue collected has only paid for capital works, and not for ongoing operation and maintenance. Offset schemes must be designed with consideration to the council's sustained financial position, and ideally money should be put aside for maintenance over the lifetime of the asset. The offset (or "in-lieu contribution") schemes being introduced in some Victorian LGAs (e.g. Kingston) are being set up to include funds for operation and maintenance.

Any policy options need to consider life cycle costs. Typically, the cost of maintenance of stormwater quality improvement devices in perpetuity (including eventual replacement) is greater when compared to initial design and construction. Therefore, lifecycle costing of blue and green infrastructure is critical as part of any examination of sustainable funding mechanisms. This must also include how internal reserves or accounts within council are established and can be used as ongoing sources of funding for individual or classes of assets.

Costs should be considered for all the different stakeholders from developers to property owners, local government and other agencies. Sustainability, equity and risk need to be considered.

4 RECOMMENDATIONS AND NEXT STEPS

The next steps in the ‘Standardising the Standards’ project will focus on developing recommendations for policy design and implementation. Some general principles are set out here

This discussion paper will be followed by a detailed recommendations paper, but this section provides some general principles for new standards, based on the points raised in the paper and the feedback from stakeholders to date.

The governance review (Macquarie University, 2017) provides a useful set of recommendations for policy reform. Key points are summarised as follows:

- There is a need for consistent policy and application
- Land use controls should be used to address the incremental rise in catchment impervious and manage diffuse pollution
- Rethink on source/lot control to sub-catchment scale outcomes
- WSUD stormwater controls near swim sites should be prioritised
- Consider temporal and spatial variations within catchment to inform what and where stormwater quality options are used
- Maximise opportunities when industrial sites redevelop to residential
- Improve compliance, regulation and monitoring at all scales
- Improve understanding of lot based WSUD devices (household level)

The fundamental principles of Ecologically Sustainable Development (ESD) should also apply:

- Decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations
- Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The global dimension of environmental impacts of actions and policies should be recognised and considered
- The need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised

- The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised
- Cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms
- Decisions and actions should provide for broad community involvement on issues which affect them

The following sections set out four key recommendations about how the next steps in the Standardising the Standards project should develop.

4.1 Wicked problems need an adaptive approach

The Parramatta River Masterplan sets out an ambitious plan for the Parramatta River, made up of a number of interconnected goals. While it is logically organised into ten steps, its implementation will not be straightforward, with:

- Many stakeholders
- A need for people and organisations to make substantial changes to behaviours and established practices
- Complex inter-dependencies between the ten steps and with other issues beyond the scope of the Masterplan
- No right or wrong solutions or well-established precedents
- Ongoing uncertainty over exactly what will be required to achieve the goals
- Emergent problems and potential unintended consequences – not all the effects of policy reform can be predicted

These are classic features of wicked problems, and it is useful to recognise this, to understand the approaches that are more likely to be effective in tackling the problem. During the Masterplan development process, the PRCG has already established an approach that is collaborative, creative and open. Because a key feature of a wicked

problem is that the solution can't be defined at the outset, it also needs an iterative, adaptive approach.

In the context of Standardising the Standards:

- The technical studies prepared as part of the Masterplan provide useful information on strategies that will help progress the Parramatta River towards a living, swimmable river, but they don't provide complete solutions.
- The strategies identified in the technical studies can be translated into new/revised policies and planning provisions for new development, however not all of their effects will be able to be predicted. As discussed in this paper, existing WSUD policies applied to infill development are leading to emergent problems (e.g. maintenance) and unintended consequences (e.g. grey rather than green infrastructure), which could not be predicted when these policies were first applied.
- There will be a need for ongoing monitoring and review of the effectiveness of planning provisions, and adjustment to these policies and provisions over time. The current project should be seen as the first iteration of an ongoing process.

This is consistent with the risk-based framework, which includes monitoring and review in Step 5, however the risk-based framework diagram from Figure 11 has been modified in Figure 15 to emphasise how it can be applied adaptively. After the risk assessment, instead of being able to answer the question "are the risks acceptable?", the question has been modified to read "are there effective strategies to reduce the risks?" This provides a basis to design and implement new and revised policy and planning provisions, which will be moving in the right direction. Information from monitoring and review should be used to refine the risk assessment over time, as more information becomes available.

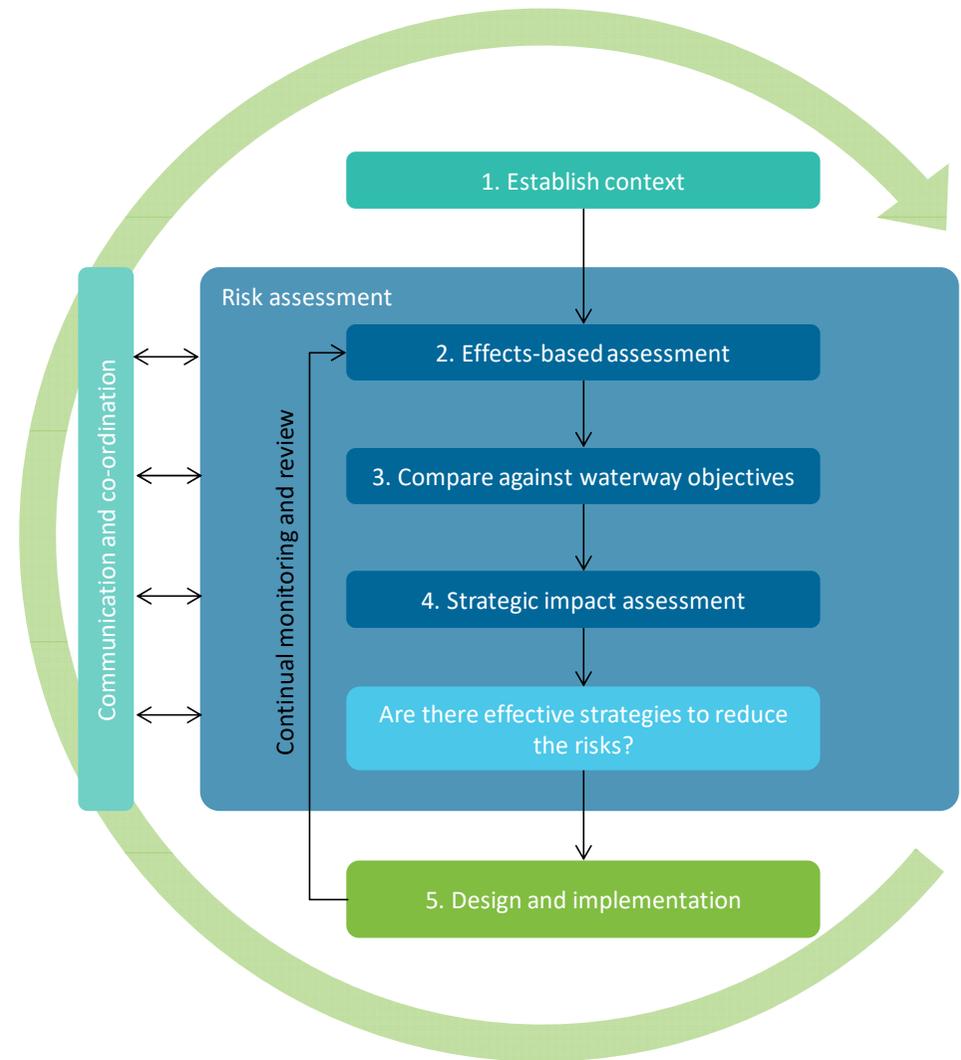


Figure 15: Modified risk-based framework, emphasising how it can be applied adaptively

4.2 Start with the framework

Most of the Parramatta River catchment councils prepared Planning Proposals for new LEPs in 2019, and their attention is now turning to revising their DCPs. Part of the current project is to provide advice on DCP provisions, as there is a clear and present need for this.

However, Step 4 in the Parramatta River Masterplan also flagged the need for higher-level planning reform, for example a review of BASIX targets or an over-arching policy and planning mechanisms for the entire catchment. This has been a common recommendation to improve the implementation of WSUD in Sydney – for example Choi and McIlrath (2017) also recommended “a clearly mandated state planning policy for WSUD”.

Therefore, rather than launching directly into proposed DCP provisions, the next stage of the Standardising the Standards project should aim to develop a clear policy framework, including:

- Objectives and targets
- Methods to assess proposed developments
- Mechanisms to check compliance and undertake ongoing monitoring and review
- Consideration of life cycle costs and potential funding mechanisms

Once the policy framework is established, the best mechanism/s for implementation could then be identified, and provisions drafted.

4.3 Maintain a clear line of sight to waterway health

One of the challenges in the Parramatta River context, which is also related to its nature as a wicked problem, is that amidst a complex set of interconnected issues, while encouraging integrated green infrastructure and embracing an adaptive approach, it is also important to maintain a clear line of sight between the Masterplan goals and the standards required of new development. Development standards need to be robust and defensible, based on available evidence and shown to be cost-effective.

The best available evidence for new planning provisions was summarised in Section 3.1. Figure 12 showed how the high-level goals from the Masterplan (e.g. “clean, clear water”) translate into quantifiable objectives (e.g. a reduction in enterococci loads) and then into more readily measurable physical indicators (e.g. reduced runoff, increased pervious area). As more detailed recommendations are developed in the next stage of the project, the links between the Masterplan goals and the proposed planning provisions need to be maintained.

A line of sight between high-level goals and specific measurable indicators will also be supported by monitoring and review, which should measure outcomes at multiple levels, from the simple physical indicators to the bigger objectives and the high-level goals, confirming whether progress is on track at all these levels.

4.4 It’s not all about ‘standardising’

The word ‘standardising’ implies that the aim is for consistent standards across the Parramatta River catchment, however this seems somewhat at odds with the concept of place-based planning, and with the identified need to set realistic requirements at different scales.

The aim should be for consistent and transparent standards, which allow for logical variation based on geography, scale and type of development. Planning provisions should be easy to interpret and apply for non-specialist personnel. The following suggestions have also been made by participants in the Standardising the Standards project:

- The PRCG should consider developing standard definitions for key terms, to promote consistent interpretation and application across the catchment area
- There is a need to consider how planning provisions may be applied by councils that cross catchment boundaries, and also have a need to apply a consistent approach within their LGA
- Within any framework of standardised controls, there must be flexibility to allow State and local government authorities to implement context-specific development controls and stretch targets

5 REFERENCES

Ardren, R 2019 The private experience of managing and maintaining stormwater quality improvement devices. Presentation at Stormwater NSW conference, Coffs Harbour 28 August 2019

BMT WBM 2018 Greater Sydney Harbour Estuary Coastal Management Program Scoping Study Final Report, June 2018. In partnership with Greater Sydney Local Land Services, Office of Environment and Heritage and Council of the City of Sydney

Bright, L 2018 NSW local government stormwater levy in use – successes, shortcomings and the case for change. Presentation to the NSW Stormwater Conference, Newcastle, 9 October 2018

Choi, L and McIlrath, B 2017, Policy Frameworks for Water Sensitive Urban Design in 5 Australian Cities. CRC for Water Sensitive Cities, Monash University Victoria.

City of Parramatta 2019, Draft Local Strategic Planning Statement. Parramatta City Council. https://oursay-files.s3-ap-southeast-2.amazonaws.com/production/fm/osp-ug-73/lsp/lsp_draft/lsp_draft_exhibition_copy.pdf. Viewed November 2019

City of Ryde 2019, Draft Local Strategic Planning Statement. Ryde City Council. <https://www.ryde.nsw.gov.au/haveyoursay/Past-Have-Your-Say/Draft-Local-Strategic-Planning-Statement>. City of Ryde. Viewed November 2019

Coffee, N.T., Lange, J. and Baker, E. 2016 “Visualising 30 Years of Population Density Change in Australia’s Major Capital Cities” Australian Geographer, Volume 47, Issue 4

Cooperative Research Centre for Water Sensitive Cities 2018, Vision and Transition Strategy for a Water Sensitive Greater Sydney. Monash University, Victoria

CT Environmental 2016, Parramatta River Catchment Ecological Health Project, report prepared for the Parramatta River Catchment Group

Greater Sydney Commission 2018a, The Greater Sydney Region Plan - A Metropolis of Three Cities. <https://www.greater.sydney/metropolis-of-three-cities>. Viewed October 2019

Greater Sydney Commission 2018b, Central City District Plan. <https://www.greater.sydney/central-city-district-plan>. Viewed October 2019

Greater Sydney Commission 2018c, Eastern City District Plan. <https://www.greater.sydney/eastern-city-district-plan>. Viewed October 2019

Greater Sydney Commission 2018d, North District Plan. <https://www.greater.sydney/north-district-plan>. Viewed October 2019

Greater Sydney Commission 2018e, LEP Roadmap guidelines for updating Local Environment Plans to give effect to the District Plans in the Greater Sydney Region

Jamali B; Bach PM; Cunningham L; Deletic A, 2019, 'A Cellular Automata Fast Flood Evaluation (CA-ffé) Model', Water Resources Research, vol. 55, pp. 4936 - 4953

Macquarie University 2017, Parramatta River Waterway Governance Review, prepared for the Parramatta River Catchment Group

McGregor Coxall 2018, Parramatta River Swim Site Activation Framework, prepared for the Parramatta River Catchment Group

NSW Government 2017a, SEPP (Environment) Explanation of Intended Effect, October 2017. <https://www.planning.nsw.gov.au/Policy-and-Legislation/State-Environmental-Planning-Policies-Review/Draft-Environment-SEPP>. Viewed October 2019

NSW Government 2017b, Metropolitan Water Plan. At Page 45. Available at <https://www.planning.nsw.gov.au/-/media/Files/DPE/Other/About-us/Metropolitan-Water/2017-Metropolitan-Water-Plan.pdf>, viewed October 2019

NSW Government 2018a, Local Strategic Planning Statements Guideline for Councils. <https://www.planning.nsw.gov.au/About-Us/Departmental-events/Planning-Connects/The-Local-Strategic-Planning-Statement-LSPP-rationale-purpose-and-practical-use>. Viewed October 2019

NSW Government 2018b, Draft Standard DCP Table of Contents Discussion Paper, December 2018

NSW Government 2019 population projection data: <https://www.planning.nsw.gov.au/Research-and-Demography/Population-projections/Projections>

NSW Government Architect 2017, Greener places; establishing an urban Green Infrastructure policy for New South Wales (Draft) <https://www.governmentarchitect.nsw.gov.au/policies/greener-places> NSW Government, viewed November 2019

NSW Planning 2011, BASIX Five Year Outcomes Summary. <https://www.basix.nsw.gov.au/iframe/about-basix/news/reports.html>. Viewed October 2019

NSW Office of Environment and Heritage and The Environment Protection Authority 2017, Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions, <https://www.environment.nsw.gov.au/research-and-publications/publications-search/risk-based-framework-for-considering-waterway-health-outcomes-in-strategic-land-use-planning>, NSW Government, Sydney, viewed Nov 2019

Parramatta River Catchment Group 2018, Duba, Budu, Barra: Ten Steps to a Living River, the Parramatta River Masterplan. <http://www.ourlivingriver.com.au/our-plan/parramatta-river-masterplan/>. Viewed October 2019

Seed Consulting Services 2019 Perspectives on performance-based planning provisions and assessment frameworks for green infrastructure and WSUD. Prepared for Water Sensitive South Australia, In collaboration with: DesignFlow, Ekistics and CRC for Water Sensitive Cities. <https://www.watersensitivesa.com/the-best-of-green-infrastructure-and-water-sensitive-urban-design-policy/> Viewed October 2019

Sydney Olympic Park Authority 2016, Stormwater Management and Water Sensitive Urban Design Policy, POL13/4, 18 October 2016. <https://www.sopa.nsw.gov.au/Resource-Centre/Resource-Publications>. Viewed October 2019

Sydney Water 2018, Parramatta River Masterplan Water Quality Modelling, Report prepared for Sydney Water and Parramatta River Catchment Group by Jacobs on behalf of the ENSure JV. Final, July 2018.

Tyrell Studio 2017 Sydney Green Grid Spatial Framework and Project Opportunities, prepared for the NSW Department of Planning and Environment in association with the NSW Office of the Government Architect, Final Report, March 2017. <https://www.governmentarchitect.nsw.gov.au/projects/sydney-green-grid> Viewed November 2019

Victoria Department of Environment, Land, Water and Planning, 2018a, Issues Paper for the Improving Stormwater Management Advisory Committee, June 2018. <https://engage.vic.gov.au/improving-stormwater-management-advisory-committee>. Viewed October 2019

Victoria Department of Environment, Land, Water and Planning, 2018b, Improving Stormwater Management Advisory Committee Final Report, 4 September 2018. <https://engage.vic.gov.au/improving-stormwater-management-advisory-committee>. Viewed October 2019