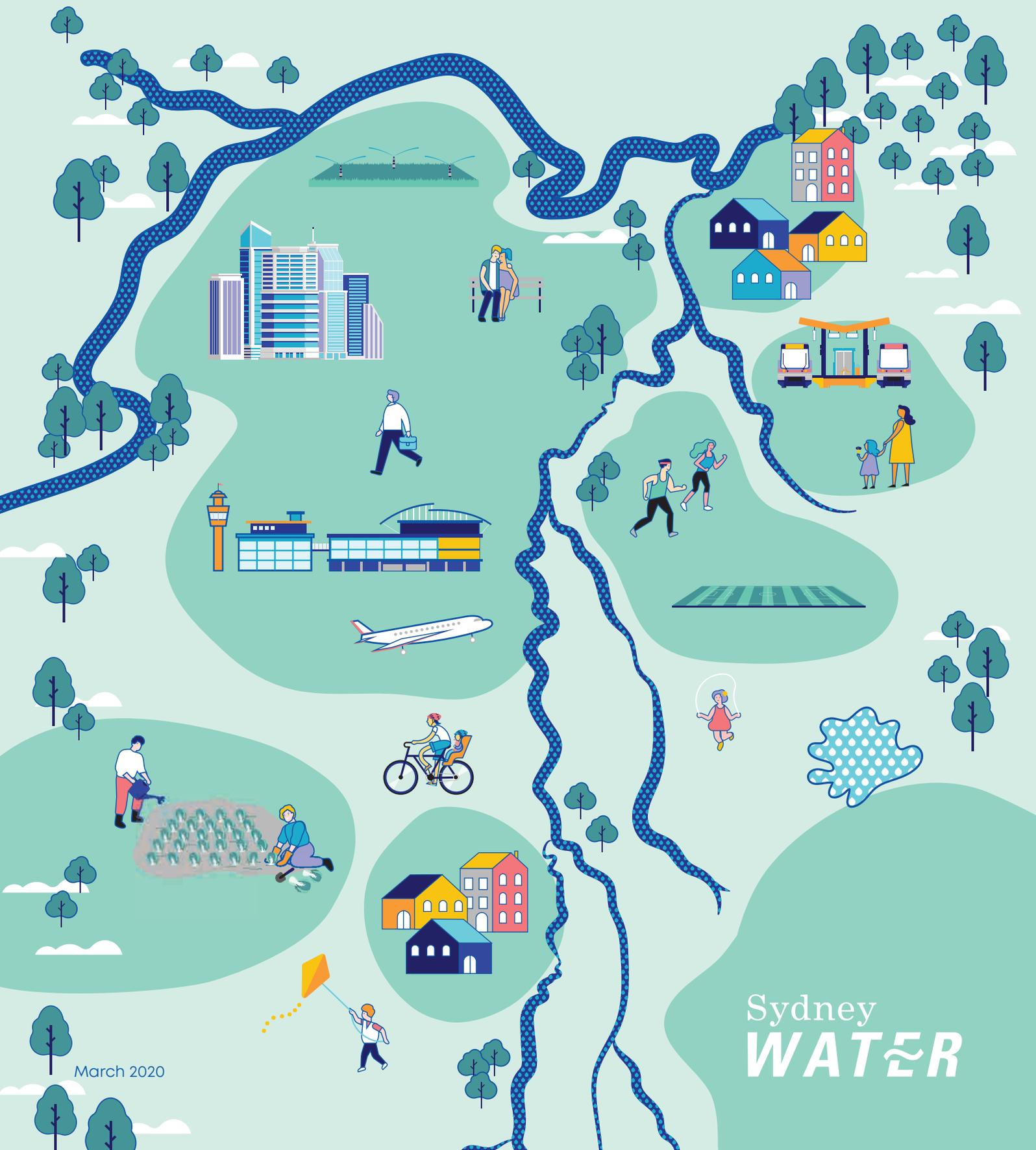


Re-imagining water in Western Sydney

Western Sydney Regional Master Plan



March 2020

Sydney
WATER

Foreword



A message from Paul Plowman

It is an exciting and proud moment to release the first ever *Western Sydney Regional Master Plan – Re-imagining water in Western Sydney*, developed in partnership with key stakeholders in the region.

Unprecedented investment in Western Sydney is driving an exciting transformation centred around Greater Sydney's new second international airport. By 2056 Western Sydney's population is forecast to double, reaching a total population of 1.5 million.

Re-valuing the vast volumes of stormwater and wastewater, ensuring every drop of water is being put to its best use, will help us ensure we have enough resources to service a growing Sydney.

Without sufficient water, the Western Parkland City, the Greater Sydney Commission's vision for a city centred on the Western Sydney Airport, is hard to imagine coming to fruition in what is the hottest and driest part of Sydney. We forecast that between 20 and 30 percent more water will be needed.

So, right now we must ask ourselves, as Sydney's landscape changes and resources become scarcer due to climate change: *what can we do differently?*

Re-imagining water in Western Sydney outlines the choices we have today and tomorrow to follow the path towards an integrated water future, to keep water in the landscape and bring about whole-of-community benefits.

I look forward to continuing this work with the community to ensure the right services are delivered at the right time, ensuring our customers enjoy affordable and resilient water services that will help shape a greener, cooler and dynamic new city.

Paul Plowman
General Manager,
Liveable Cities Solutions

Acknowledgment

Sydney Water acknowledges the traditional owners of the lands that include the Western Sydney Region and the living culture of the traditional custodians of these lands. Sydney Water recognises that the traditional owners have occupied and cared for this Country over countless generations and celebrates their continuing contribution to the life of Western Sydney.

The Western Sydney Regional Master Plan project has been a collaborative effort between Sydney Water, Aecom Aurecon Joint Venture (AAJV) and Marsden Jacob Associates.

Sydney Water would also like to thank the following organisations who have participated in the development of this Master Plan:

- Blacktown City Council
- Camden Council
- Campbelltown City Council
- Department of Infrastructure Transport Cities and Regional Development
- Department of Planning Industry and Environment (DPIE)
- Environment Protection Authority
- Fairfield City Council
- Former Office of Environmental Heritage, now part of DPIE
- Former Department of Primary Industries, now part of DPIE
- Government Architect NSW
- Greater Sydney Commission
- Hawkesbury City Council
- The Hills Shire Council
- Infrastructure NSW
- Landcom
- Liverpool City Council
- Penrith City Council
- Water NSW
- Western Sydney Airport Co.
- Western Sydney Parklands Trust
- Western Sydney Regional Organisation of Councils
- Wollondilly Shire Council

What is the Western Sydney Regional Master Plan?

Sydney Water is re-imagining water in Western Sydney through its Western Sydney Regional Master Plan, a first for Sydney. It supports Sydney Water's vision to create a better life with world class water services and also supports the NSW Government's vision of the Western Parkland City.¹

The Master Plan does this by looking at the urban water cycle as a whole, exploring the broader value of water for community benefit, and setting long term direction to positively respond to future challenges and opportunities. It goes beyond essential water servicing to consider, integrate, and understand the economic value of water for shaping, building, greening and cooling a new Western City. The Master Plan guides Sydney Water's next steps in planning and delivering for Western Sydney.

Engagement with government stakeholders has been central to the development of the Master Plan. Stakeholders from a number of Federal and NSW government agencies, and Western Sydney local councils have been involved in workshops to help Sydney Water shape the Master Plan at key stages. The stakeholders broadly ranged from planning, infrastructure, environment, resource and land management and development sectors.

The Master Plan's vision, developed in collaboration with our stakeholders is:

“Our customers enjoy affordable and essential water services, healthy waterways and vibrant, cool and green places.”

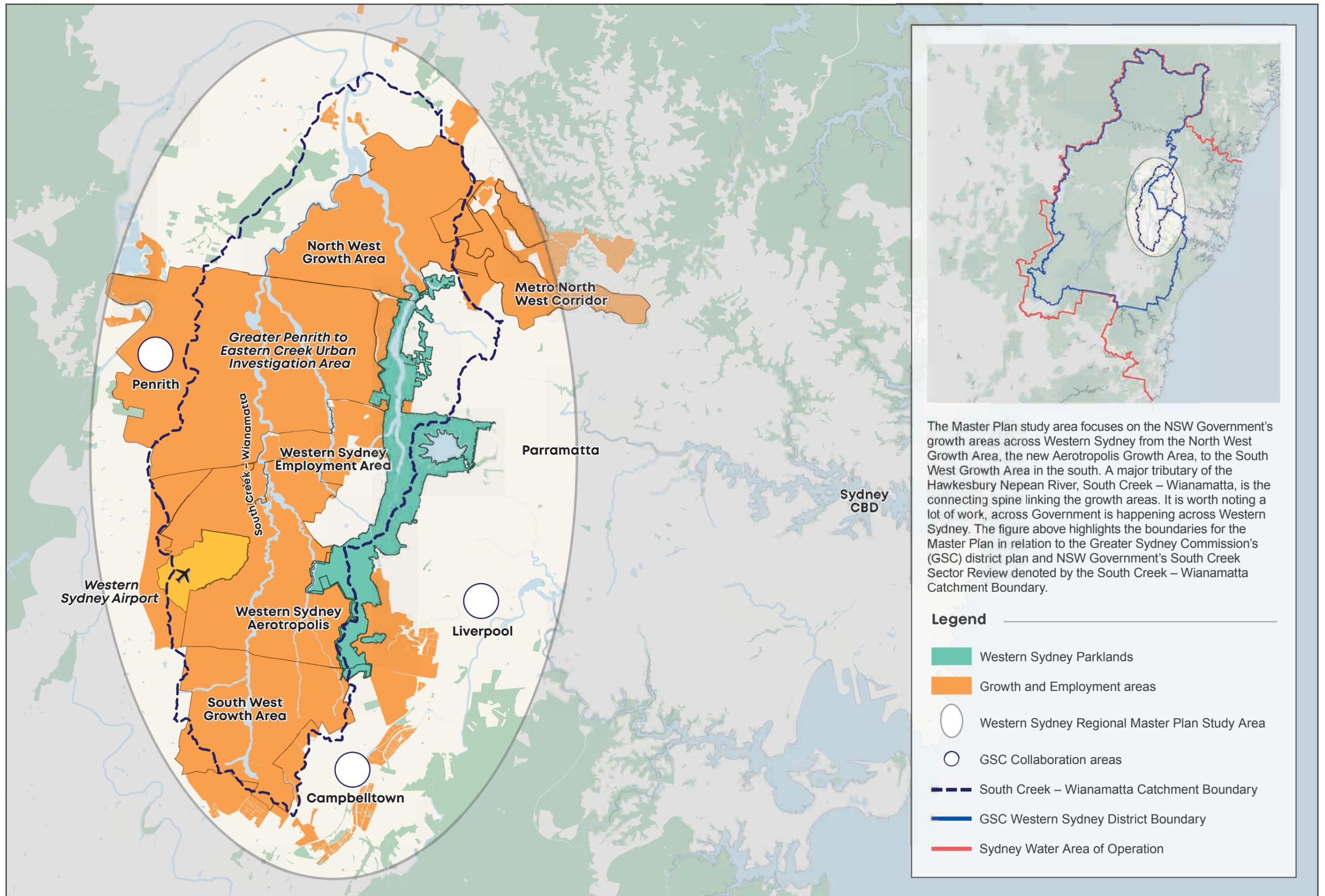


An artist impression of the Western Parkland City centred around South Creek – Wianamatta² where integrated planning delivers a city which reimagines liveability.

The master plan considers four alternative servicing pathways and highlights the important role water plays in delivering a more liveable Western Parkland City. The master plan sets a new direction for servicing Western Sydney, finding that an adaptable and integrated water cycle management approach delivers the greatest economic value for the region, over a conventional servicing approach.

¹ Greater Sydney Commission – Greater Sydney Region Plan – <https://www.greater.sydney/metropolis-of-three-cities>

² South Creek – Wianamatta is a dual name creek that forms part of the Hawkesbury-Nepean catchment. Wianamatta from the Dharug language means 'Mother Place'.



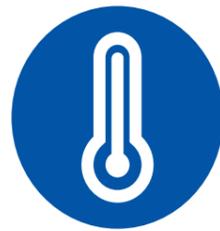
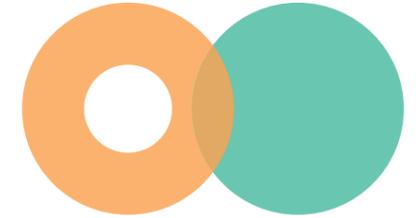
The Master Plan study area focuses on the NSW Government's growth areas across Western Sydney from the North West Growth Area, the new Aerotropolis Growth Area, to the South West Growth Area in the south. A major tributary of the Hawkesbury Nepean River, South Creek - Wianamatta, is the connecting spine linking the growth areas. It is worth noting a lot of work, across Government is happening across Western Sydney. The figure above highlights the boundaries for the Master Plan in relation to the Greater Sydney Commission's (GSC) district plan and NSW Government's South Creek Sector Review denoted by the South Creek - Wianamatta Catchment Boundary.

Why Western Sydney?

The NSW Government through the Greater Sydney Commission envisages Greater Sydney as a metropolis of three cities; the Western Parkland City, the Central River City, and the Eastern Harbour City founded on the principles of liveability, productivity and sustainability.³

Challenges and opportunities in Western Sydney present a case to manage water differently. Re-imagining and defining the ways in which water is valued, used and managed and how water services are provided, will be vital to delivering the Western Parkland City.

Along with servicing growth the Master Plan takes an adaptive approach to respond to multiple opportunities, challenges and complexities including:



Climate

Western Sydney is a hot, dry place, with a temperature increase of 6-10°C during extreme heat events compared to Sydney's east coast. In 2018, Sydney's west experienced 46 days over 35°C and even hotter and drier conditions are expected in the coming decades.



Unprecedented infrastructure investment

The Australian and NSW Governments have partnered to deliver the Western Sydney City Deal with over \$6 billion in investment committed for the construction of Western Sydney Airport and other catalytic infrastructure that will unlock opportunities in education, business and employment.



Pressures on waterway health

There will be more pressure on the sensitive waterways of the Hawkesbury-Nepean River system including South Creek – Wianamatta as the city's urban footprint continues to expand and demand for public access to waterways increases.



Urban planning

Western Sydney's population is forecast to double by 2056 reaching a total population of 1.5 million. Much of this growth will occur in currently rural or semi-rural areas. This will make the shift in current land-use planning a must to maximise integrated water cycle management principles.



Environmental regulation

Minimising nutrients and managing flows in the Hawkesbury-Nepean, South Creek – Wianamatta, and tributaries will be important as more stringent nutrient loads are set under environment protection licences over time.



Water security

Australia is in the grip of one of the most crippling droughts in recent history. Long dry spells are likely to increase as the effects of climate change make themselves felt with increased likelihood and duration of drought conditions. This threat affects the resilience of Western Sydney's water supply which currently depends on adequate rainfall in the Warragamba Dam catchment.



³ Greater Sydney Commission – Greater Sydney Region Plan – <https://www.greater.sydney/metropolis-of-three-cities>

The Master Plan approach

We took a phased approach to develop the Master Plan. Each step represented an important milestone in the development of the Master Plan as well as an opportunity to engage with key stakeholders and confirm direction.

Issues and directions

- Understand the servicing context for the region
- Outlining the planning challenges, issues and opportunities
- Proposing alternative servicing concepts

Concept development

- Alternative servicing concepts and a base case analysed
- Water and resource balance developed for each concept
- High level investment costs and economic benefits evaluated

Pathway development

- Concepts combined into four servicing pathways that reflect different level of water integration
- Water and resources balance re-evaluated
- High-level investment costs developed for each pathway
- Economic benefits evaluated for each pathway

Adaptive plan

- Ongoing monitoring of external uncertainties likely to emerge
- Reassessing the application of the servicing pathways in response to the uncertainties
- Primary pathway selected and adaptive plan developed
- Roll out of analysis into next steps of planning

2017

October 2017

Workshop 1: framing workshop

Introduced the Master Plan to our external stakeholders and how the vision and servicing concepts were developed.

December 2017

Workshop 2: development of servicing concepts

Showcased the alternative servicing concept. This workshop also sought opportunities to collaborate with stakeholders and identify key enabling factors for each concept.

March 2018

Concept development briefing session

Relayed the stage outcomes and next steps in the Master Plan.

2018

August 2018

Development of pathways (Sydney Water)

A series of collaborative team sessions with internal stakeholders to develop servicing pathways.

August 2018

Workshop 3: servicing pathways analysis (Sydney Water)

Reviewed and tested the thinking behind preliminary servicing pathways complete with a water balance assessment.

October 2018

Workshop 4: servicing pathways analysis

Feedback on work completed and identifying events which may influence an adaptive strategy.

2019

July 2019

Master Plan outcomes briefing

Presented the Master Plan and adaptive strategy for the Western Sydney region.

2020

Servicing pathways considered in the Master Plan

Pathway 1 – Drained City

Conventional servicing principles with reference to existing regulation, policy and governance. Represents what could be considered the baseline servicing approach for the region. It relies on transferring wastewater out of the catchment and is the only pathway that does not achieve the Parkland City vision outcomes.

Urban land form – current land use typologies which consist of single/detached dwellings.

Pathway 2 – Water Cycle City

Reuse of wastewater and stormwater for non-drinking purposes in order to retain water within the landscape and reuse locally to support sustainability, resilience and liveability drivers. This pathway is largely focused around a core servicing concept to enable the proposed South Creek – Wianamatta blue-green corridor.

Urban land form – shift towards parkland typologies which consist of medium/high density multi dwellings.

Pathway 3 – Water Centric City

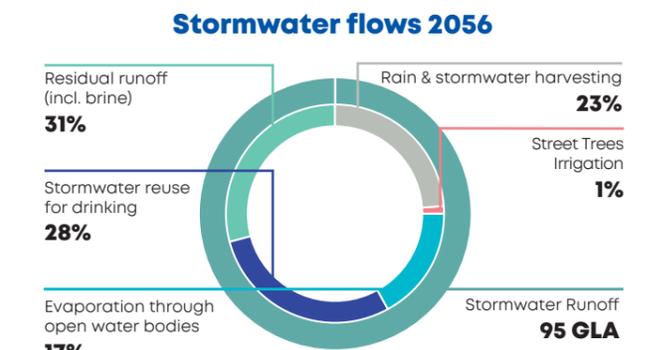
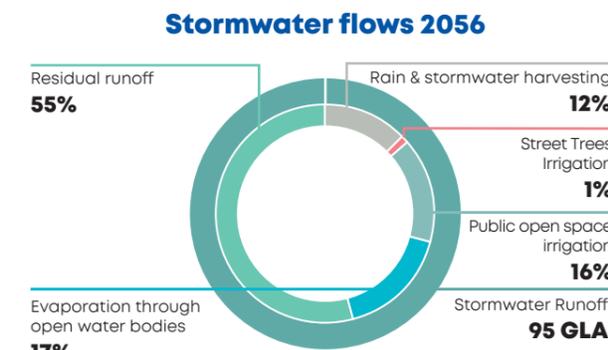
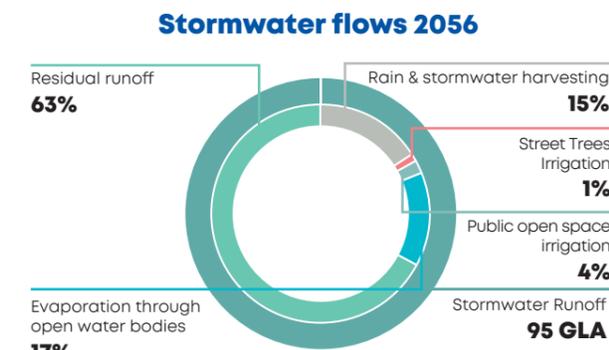
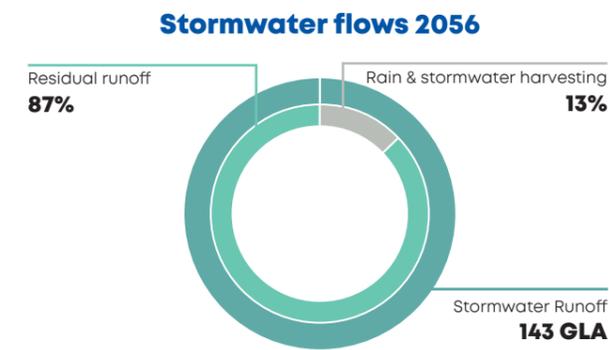
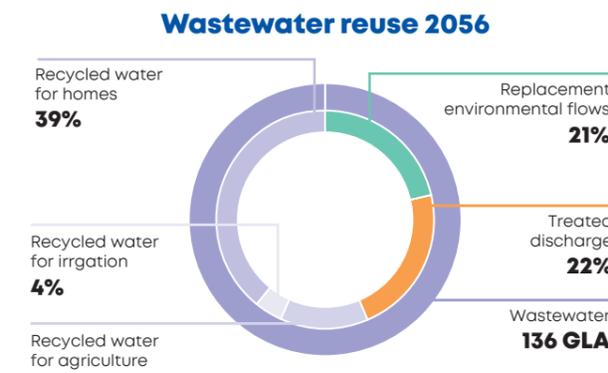
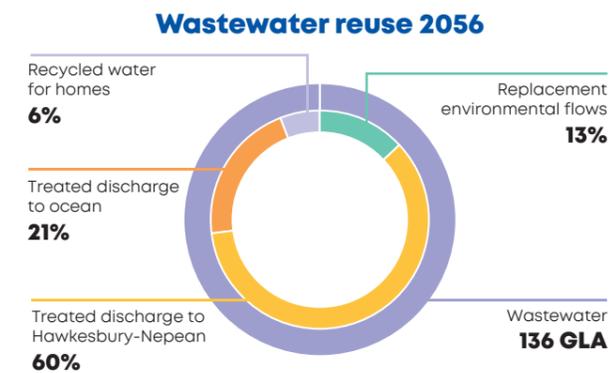
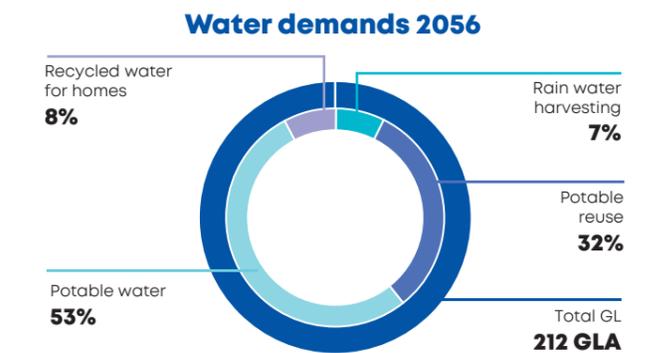
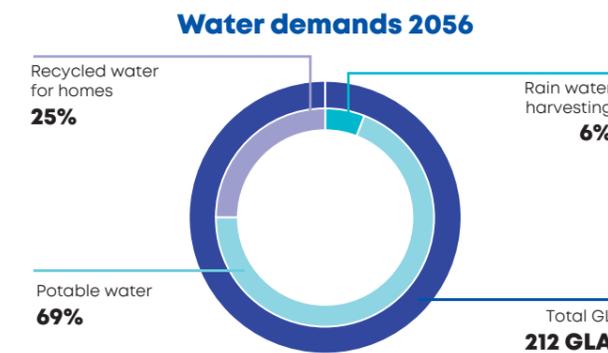
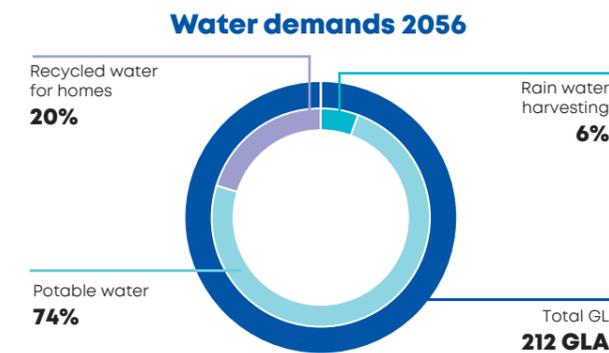
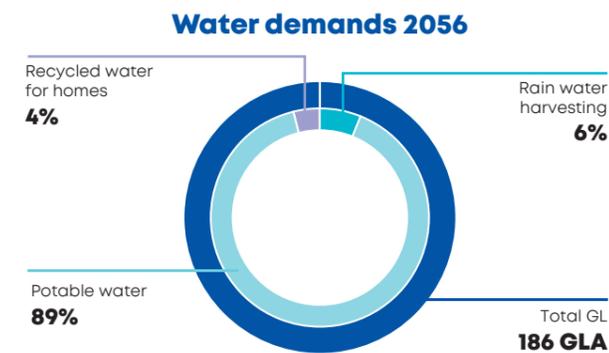
Considers discrete integrated water servicing through the region with small scale servicing schemes. Focused around servicing to maximise flexibility in response to the remote development fronts of growth and differing levels of service outcomes desired by the customers in Western Sydney.

Urban land form – shift towards parkland typologies which consist of medium/high density multi dwellings.

Pathway 4 – Water Resilient City

Reuse of wastewater and stormwater for drinking purposes in order to minimise environmental discharge and maximise recycling to support regional sustainability, resilience and liveability drivers. Focused around a core servicing concept that enables treated recycled water for drinking depending on community attitudes and acceptance.

Urban land form – shift towards parkland typologies which consist of medium/high density multi dwellings.



Note:
 1. GLA = gigalitre per annum. For reference, Sydney Harbour holds approximately 500 GL of water.
 2. Stormwater runoff refers to the amount of stormwater that sheds off or pools on the land surface. This is highly influenced by the urban land form, which determines perviousness of the land.
 3. Replacement environmental flows substitute environmental flows from the drinking water in our dam/s. These flows help naturalise river flow regime to improve water quality and ecology.

Improved water services to bring value to the Parkland City

Four pathways were evaluated to understand the environmental, customer and community benefits in the form of a Cost Benefit Analysis (CBA). The benefits evaluated include:

<p>Urban greening and blueing</p> <ul style="list-style-type: none"> Active and passive recreation open space, contributing to health, wellbeing and productivity Shade from tree canopies and reduction in sun exposure, plus microclimate regulation Urban Cooling, reduced energy demand and carbon emissions Improved property values near waterways and green infrastructure assets 	<p>Environment</p> <ul style="list-style-type: none"> Urban greening stores carbon and improves air quality via pollution removal, lowering incidence of health impacts Protection of waterways through rainfall and stormwater interception and reuse Providing and improving habitat for wildlife
<p>Avoided Infrastructure</p> <ul style="list-style-type: none"> Avoided water and wastewater investment benefits to Greater Sydney households through lower water and wastewater prices Avoided stormwater runoff benefits to Greater Sydney residents and local government through improved waterway (South Creek – Wianamatta and Hawkesbury-Nepean River) conditions and reduced infrastructure and remediation costs 	<p>Diverse water supply</p> <ul style="list-style-type: none"> Additional recycled water supply to agriculture and households alleviating pressure on existing water resources Increased agriculture production with supply of recycled water

The findings of the CBA, as shown in the table below.

	Drained City	Water Cycle City	Water Centric City	Water Resilient City
Totex cost (40 year)	\$ 26.3 billion	\$ 28.3 billion	\$ 28.7 billion	\$ 31.3 billion
Baseline benefits *	\$ 24.0 billion	\$ 24.0 billion	\$ 24.0 billion	\$ 24.0 billion
Benefits quantified **	+ \$ 0.3 billion	+ \$ 10.1 billion	+ \$ 10.0 billion	+ \$ 10.9 billion
Net total	- \$ 2.0 billion	+ \$ 5.8 billion	+ \$ 5.3 billion	+ \$ 3.6 billion

* Underlying benefits of basic water and wastewater servicing

** Additional benefits from higher levels of water and wastewater servicing

Key take away:

- The incremental cost (\$2 billion) in servicing the Parkland City vision brings substantial benefit, such that economically it is preferred over conventional servicing.
- The additional benefits of investing in integrated water cycle servicing to support the Parkland City is derived from liveability and amenity outcomes associated with greener and bluer urban environment. These benefits mature at 2056. There are also additional benefits from increased agricultural production.
- The economic results of pathways 2, 3 and 4 are close enough that the servicing approach is less important. The economic analysis showed that there is an additional cost associated with servicing the Parkland City, each pathway delivers greater value than Pathway 1 – Drained City.

How we are supporting the Western Parkland City

Moving from a Drained City pathway to a Water Cycle City pathway for Western Sydney, means:

- Water sources for drinking purposes will continue to rely on dams and desalination
- More recycled water for non-drinking purposes including use within homes and businesses, irrigation of public open space, and supply for agricultural purposes
- Greater recycling, minimising excess wastewater and stormwater discharged to waterways
- An increased focus on local retention and reuse of stormwater supported by centralised co-ordinated management and governance
- Land use planning adopts Parkland City urban typologies which reduce the loss of pervious land and incorporate water sensitive urban design principles

The Master Plan aspirations for water in Western Sydney go beyond delivering clean, safe, reliable, and efficient water and wastewater services that meet our customers' needs. The master plan considers the whole of water cycle in Western Sydney and is agnostic as to who delivers the services.

The analysis highlights that the Parkland City cannot be achieved without water as water is needed for greening and cooling, to support liveable communities. Water also supports the development of Sydney's new second international airport, innovation precincts, and new industries.

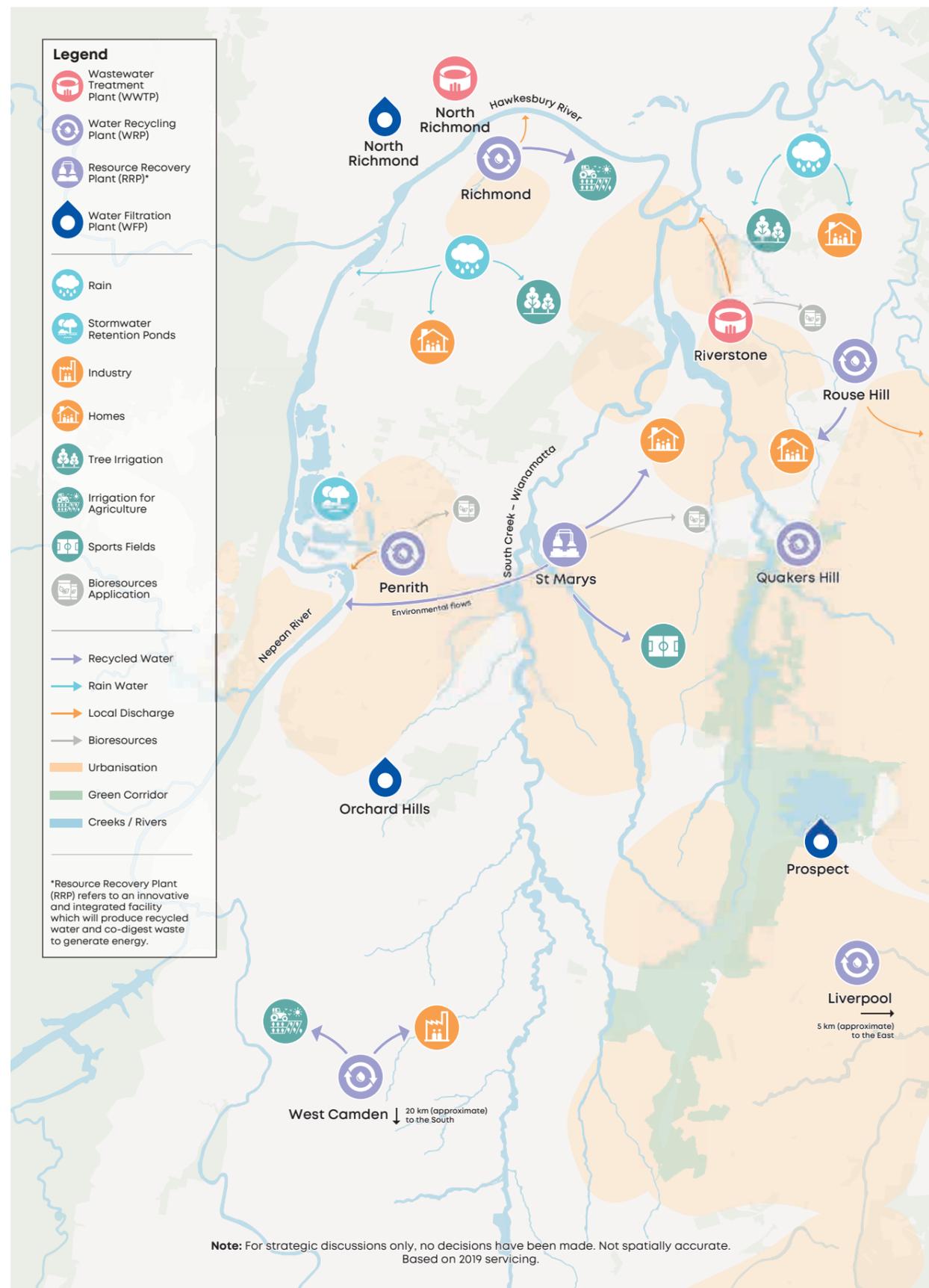
The analysis found:

- The Drained City pathway while viable, would not deliver the vision of a green and blue Western Parkland City. While only marginally less in cost, economic benefits beyond business as usual would not emerge in the longer term
- The Water Cycle City is the primary pathway on the basis that it delivers the greatest economic value at the least cost to realise the Parkland City vision. The pathway is also the most readily deliverable pathway in the current regulatory and socio-economic setting
- Pathways for a Water Centric City and a Water Resilient City are both favourable as they deliver greater economic value than the Drained City in achieving the Parkland City vision. However, some services would need to be tested for community acceptance. These pathways will be explored for opportunities if regulatory, environment and socio economic conditions change.

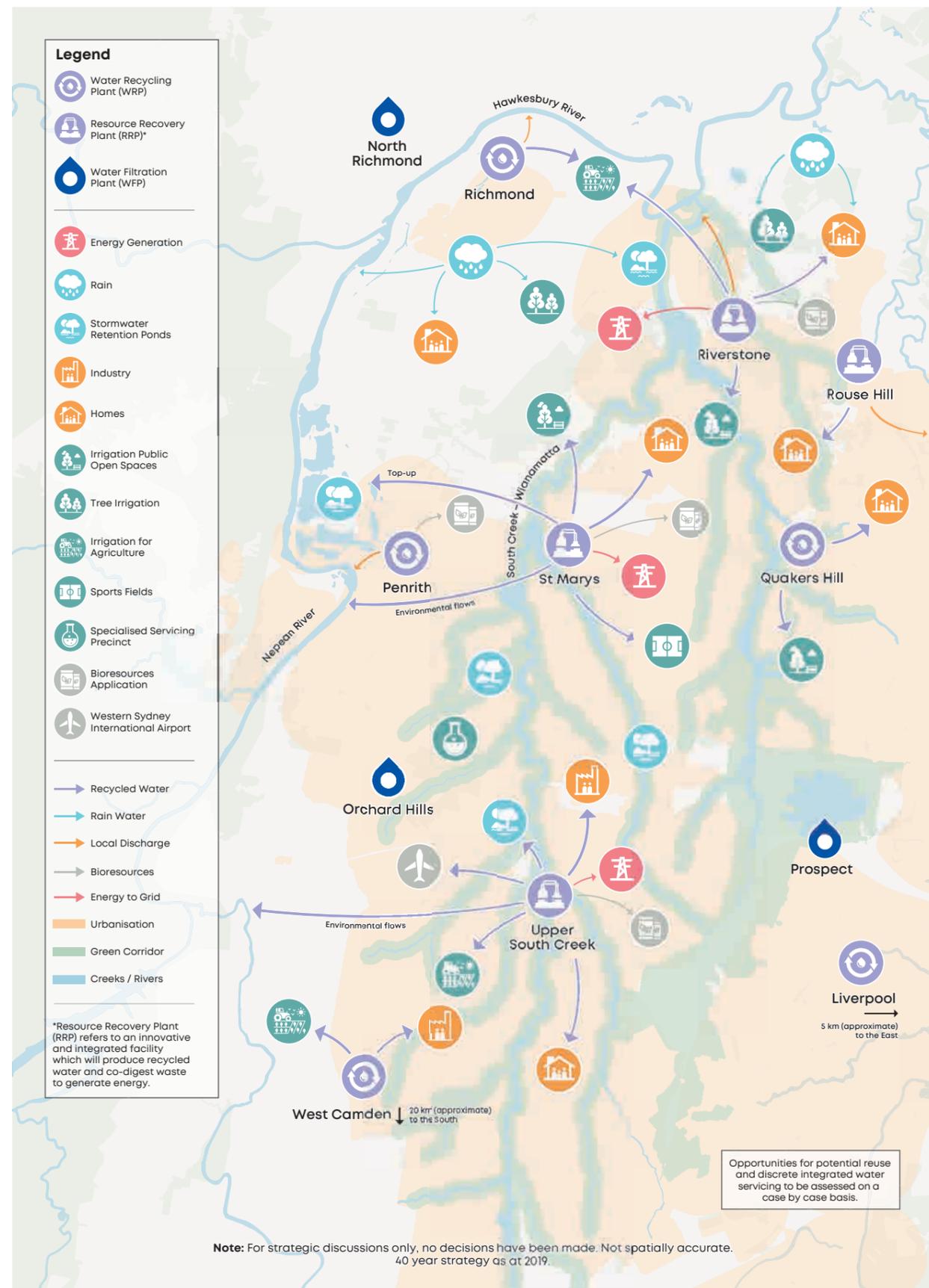
The following two pages illustrate water infrastructure and service changes from what exists today in the South Creek – Wianamatta catchment, to what is needed by 2056 to deliver the Western Parkland City. The ultimate aim is to maximise the value delivered for Western Sydney by securing the long-term vision of the Western Parkland City so that our customers enjoy affordable and essential water services, healthy waterways and vibrant, cool and green places.

Whilst Water Cycle City pathway is the primary pathway for the whole region, components of Water Centric City and Water Resilient City would be leveraged on an opportunistic basis for individual projects in Western Sydney. An adaptive plan has been developed to explore what this means.

Western Sydney Servicing today



Re-imagining Western Sydney Servicing 2056



A flexible, adaptive approach

The future rates of growth, climate patterns, technological advancements, catchment system responses to changes, social and political environments can all be forecast, however, the level of certainty decreases over time. Adaptive planning can be used for decision making in the face of uncertainty and features the following characteristics and includes:

- Provisions for adaptation as conditions change and knowledge is gained with the ability to accelerate decisions in response to specific triggers,
- A combination of actions to be taken right away with those that make important commitments to shape the future and those that preserve needed flexibility for the future, and
- Specification of a monitoring system, together with the specification of actions to be taken when specific trigger values are reached.

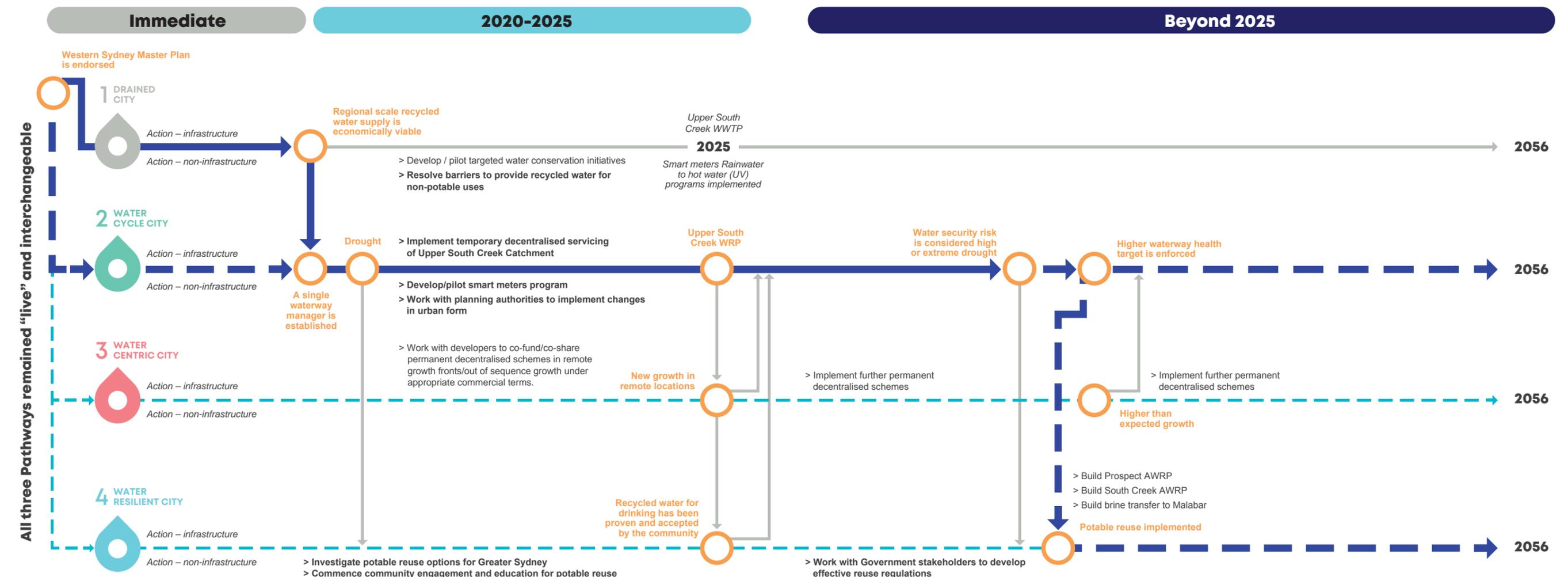
Should the need or an opportunity arise the plan offers flexibility to move from the Water Cycle City pathway towards other servicing pathways. The diagram below outlines the possible interconnectivity between the servicing pathways and also the horizons at which certain pathways are expected to become redundant, as it will no longer realise the extent of the benefit to make a strong business case.

Continued stakeholder collaboration and monitoring of actual growth, climate, environmental responses to development, technological advancements, and community values and attitudes to water recycling will be necessary to inform decisions at key times over the Western City's evolution. Infrastructure planned will be scalable to be responsive to changing needs and circumstances.

The key decision points for each servicing pathways are shown in the adaptive plan below. A primary sequence of planning and delivery activities are needed to ensure that each of the pathways can remain "live".

At key points in the future, decisions will be required in order to adopt and/or discontinue the pursuit of alternate servicing pathways. These decisions are to be made by taking into account the latest information that is available at the time. An adaptive plan with appropriate robust monitoring, comprehensive trigger identification, and planned response protocol can help realise opportunities as they arise over time.

Western Sydney Adaptive Servicing Plan



Legend

- Servicing Western Sydney (Solid blue arrow)
- Servicing pathways opportunities (Dashed blue arrow)
- Pathway to keep 'Live' (Dotted blue arrow)
- Possible Pathway interchange (Grey arrow)
- Key trigger (Orange circle)

Glossary

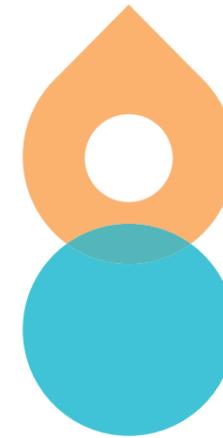
- AWRP – Advanced Water Recycling Plant
- Potable Reuse – Includes wastewater and stormwater products
- WWTP – Wastewater Treatment Plant
- WRP – Water Recycling Plant
- UV – Ultra-Violet

Delivering outcomes

Outcome	Celebrate waterways	Water how you want it	Cool and green spaces	Liveable places	Boost productivity sustainably	Resilient water sources	Customers at the heart	Deliver for the west	Valuing resources
	 <p>Protect South Creek – Wianamatta and the Hawkesbury Nepean river so they remain vital waterways that the community enjoys</p>	 <p>Facilitate tailored water services to communities that wish to use water in more integrated ways</p>	 <p>Support a network of open spaces and trees in a parkland setting with recycled water and stormwater</p>	 <p>Deliver integrated services that support the changing urban landscape and reflect community values</p>	 <p>Support economic development with recycled water for industry and agriculture</p>	 <p>Plan for future water supply that is resilient to growth and climate extremes</p>	 <p>Involve you, our customers as we plan for the future</p>	 <p>Offer services to support housing and economic growth at an affordable price</p>	 <p>Pursue diverse opportunities to use, reuse and capture water, resources and energy</p>
<p>Action plan</p>	<p>Work with State and local government to establish regional waterways governance</p> <p>Shape planning controls for the management of the riparian corridor along South Creek – Wianamatta and its tributaries through engagement with State and local government</p>	<p>Partner with developers and customers to deliver fit for purpose services including decentralised servicing where applicable and/or desired</p> <p>Align with key government agencies to provide certainty in service provisions.</p>	<p>Identify areas suitable for irrigation with recycled water</p> <p>Partner with government to develop planning guidelines for retention of stormwater within precincts to create blue and green spaces</p>	<p>Plan with consideration to the whole water cycle</p> <p>Shape planning controls to implement the right urban typologies to support the Parkland City Vision</p>	<p>Identify and investigate recycled water opportunities for commercial, industrial and agricultural uses to boost economic growth sustainability in Western Sydney</p>	<p>Stage infrastructure by establishing “no regrets” planning actions that enhance ability to adopt other water servicing concepts</p> <p>Include climate resilience in criteria for all planning decision models</p>	<p>Plan for the future through customer engagement</p> <p>Collaborate with stakeholders including Local Aboriginal Land Councils and Developers</p> <p>Facilitate collaboration with keys partners to co-create, build trust and successfully deliver product and service offerings</p>	<p>Develop servicing plans for Western Sydney that meet regulatory and customer expectations that are valued and cost effective</p> <p>Explore funding mechanisms to deliver the Parkland City outcomes</p>	<p>Plans to optimise delivery of water recycling to Western Sydney</p> <p>Deliver a resource recovery facility in the Western Sydney Aerotropolis</p> <p>Investigate and support all recycled water markets in Western Sydney</p>

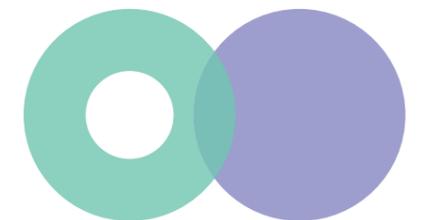


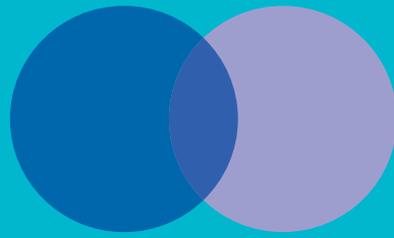
Note: figures developed from the Master Plan analysis



Western Sydney Regional Master Plan vision

Our customers enjoy affordable and essential water services, healthy waterways and vibrant, cool and green places.





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