



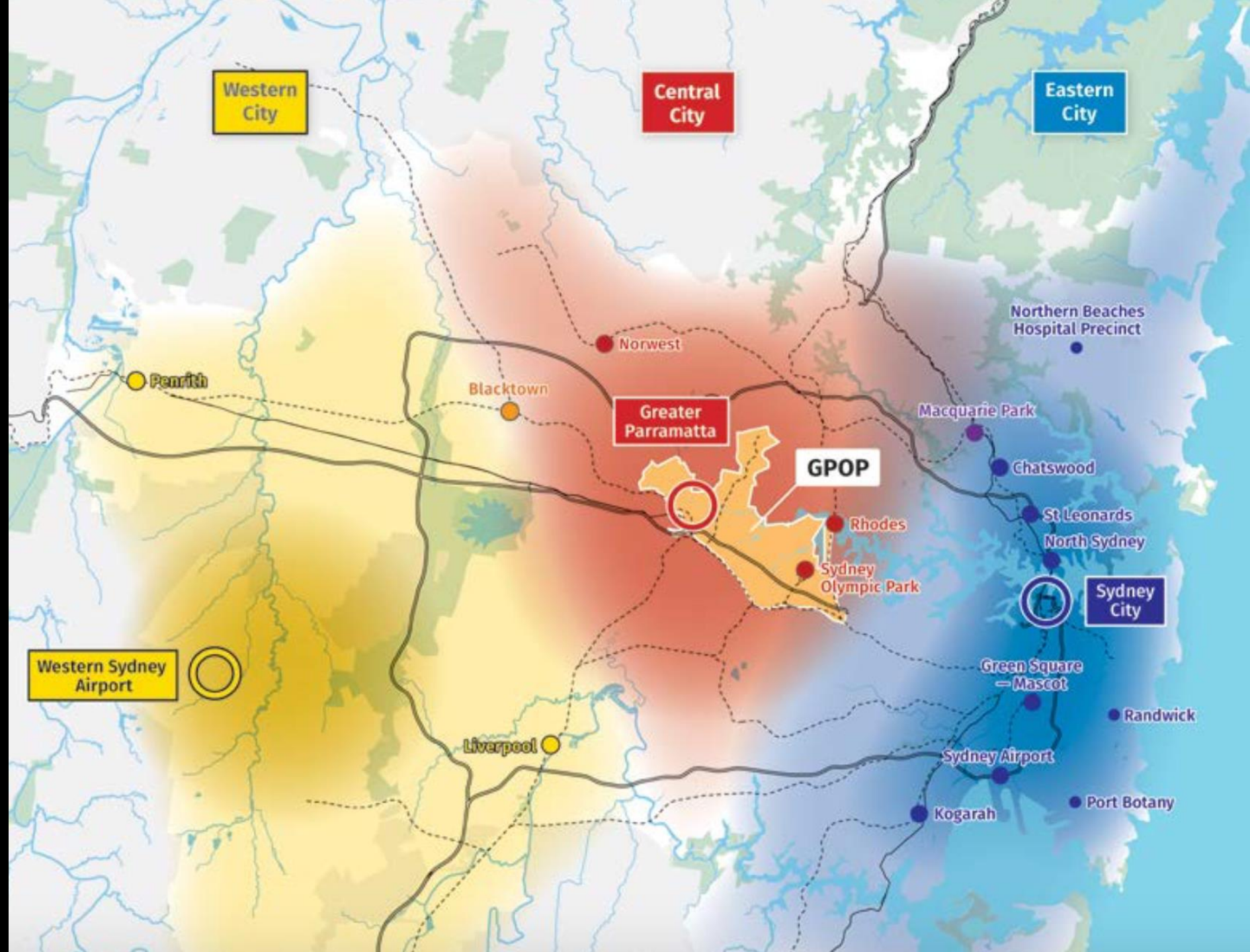
Sydney
WATER

**BLIGH
TANNER**

The GPOP Green Grid

Making Sydney's new heart cooler
and greener

Growth of Sydney





Opportunities for a Water Sensitive Greater Sydney
The importance of water in our city's future

A WATER VISION FOR GREATER SYDNEY:



Sydney will transform to a Water Sensitive City to ensure a resilient, liveable and sustainable future

Sydney's residents, business and visitors have access to high quality landscapes, safe water and healthy waterways.

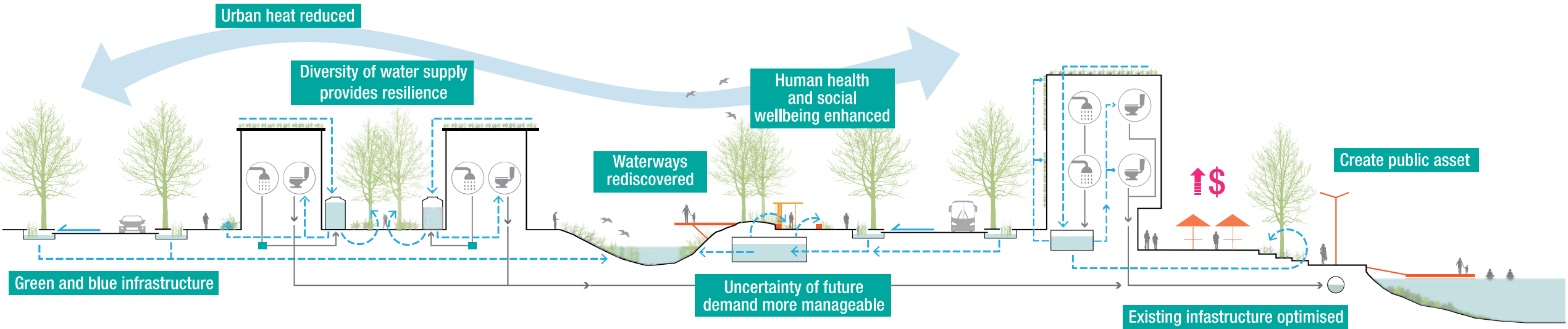
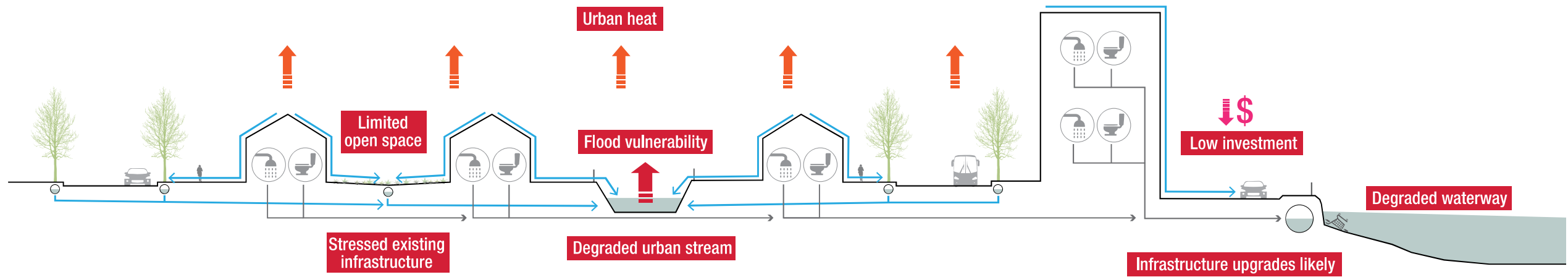
A Water Sensitive City collects and recycles all sources of water and incorporates a green grid of parks, bushland and other vegetated areas to cool, clean and beautify urban spaces and surrounding landscapes. It empowers communities to make their own decisions about water and creates social connections around urban waterways and water features.

WATER SENSITIVE PLANNING PRINCIPLES FOR GREATER SYDNEY:

1 Promote development that protects, maintains or restores waterway health and the community's environmental values and uses of waterways.

2 Promote integrated water cycle management that holistically considers and drives investment in sustainable water supply, reuse, wastewater, and stormwater infrastructure.

3 Promote development that fosters the relationship between water, landscapes and urban living, to enhance human and social wellbeing and promote community co-design and governance in urban water strategies.



PARRAMATTA WAYS

IMPLEMENTING SYDNEY'S GREEN GRID

DRAFT



CITY OF
PARRAMATTA





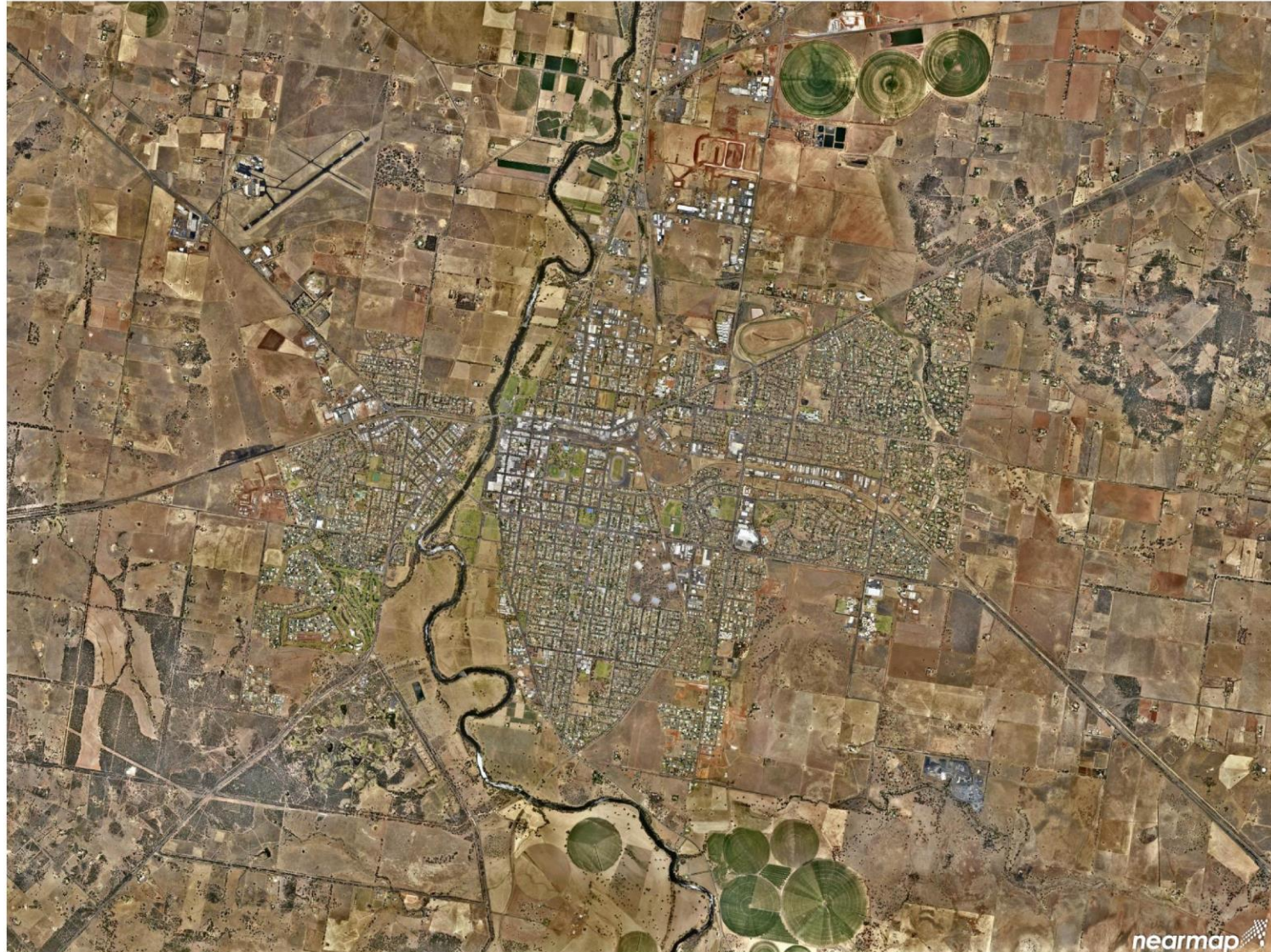


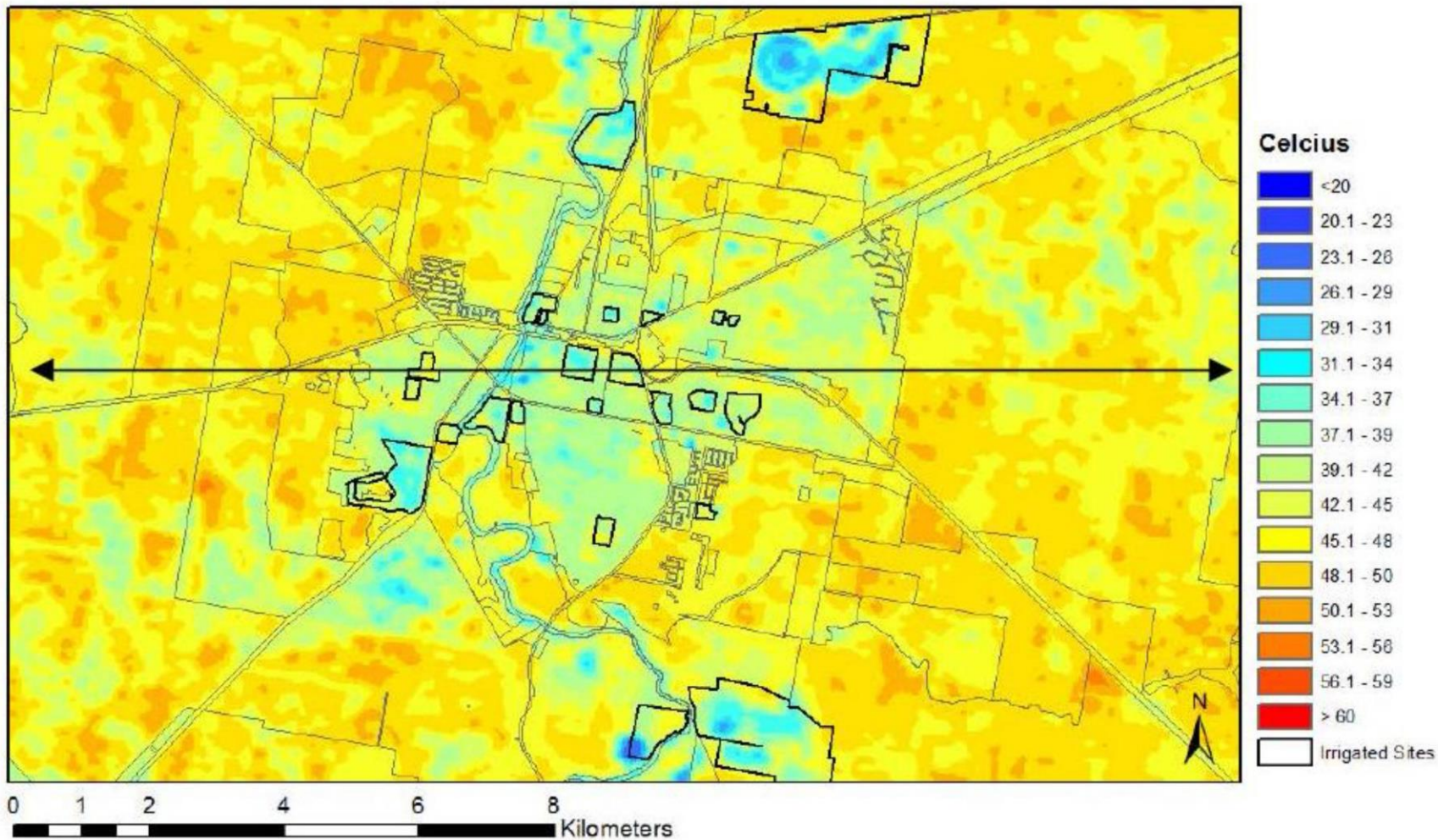
PARRAMATTA RIVER



- + The western suburbs of Sydney including Parramatta have a hotter and drier climate than areas closer to the coast.
- + They don't receive any cooling sea breezes in the afternoon when the heat reaches its maximum, so in summer the maximum temperature can be up to **9 degrees hotter** than the Sydney City forecast.
- + The number of days over 35 degrees in Western Sydney has **increased by 250%** since 1965 (compared with 22% in central Sydney) (Osborne & Sharifi 2017).

Dubbo case study






Widespread irrigation has a clear impact on urban cooling.

Case study: Dubbo:

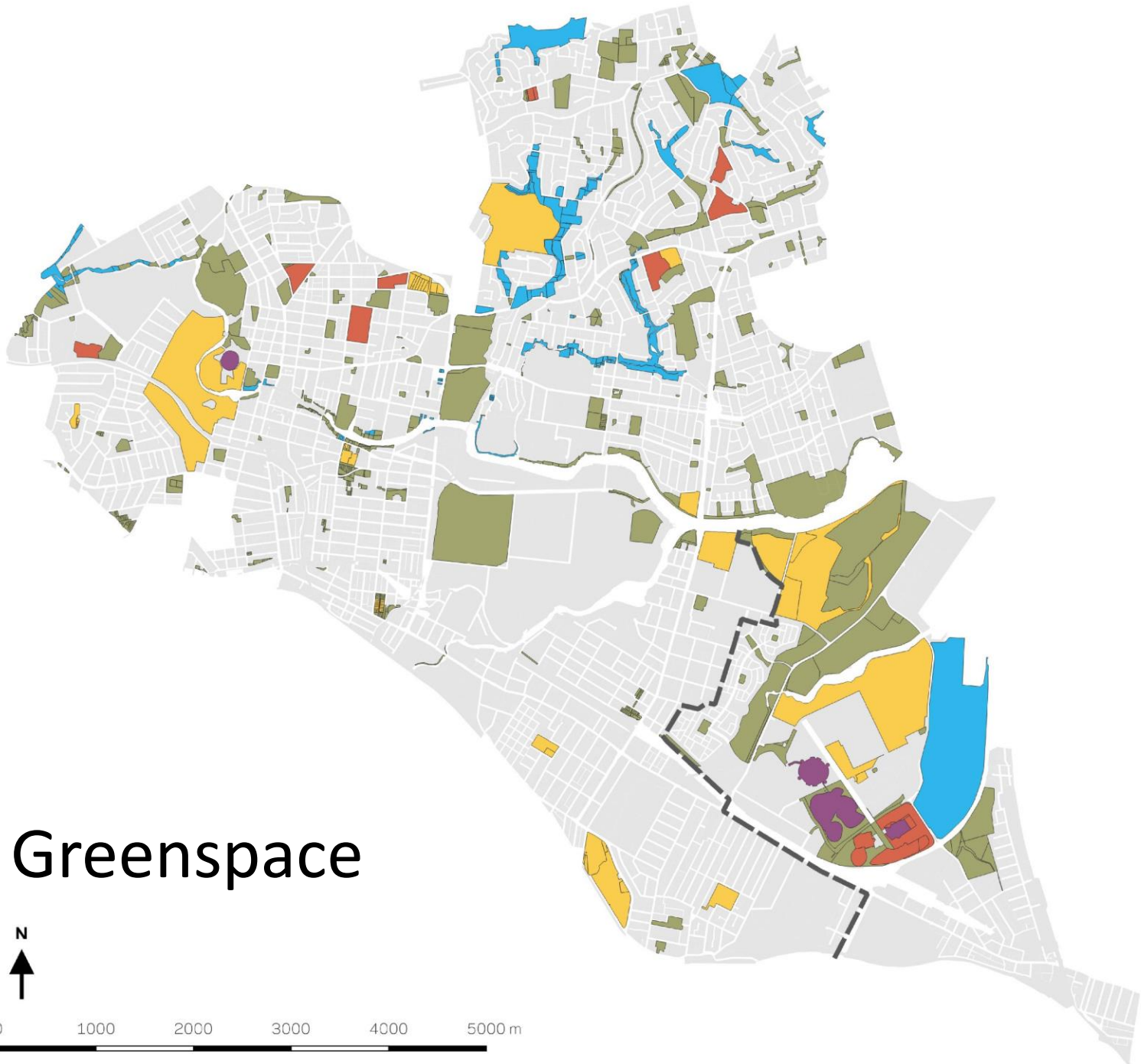
3 - 5 degrees cooler than surrounding non-irrigated landscape

FIGURE 15: Landsat TM imagery data for Dubbo, Western New South Wales on 13 January, 2005 showing the land surface temperature (LST)



The brief: develop the concept and business case for an irrigated green grid to mitigate urban heat island effects and enhance urban amenity, using a combination of local water recycling schemes and water sensitive urban design principles.





Legend

■ GOP Cadastal Database

--- SydOlyPark_BoundaryLine

Open Space Areas

■ Nil, bushlands/drainage reserves

■ Low, informal parks

■ Medium, landscaped areas, high-profile parks

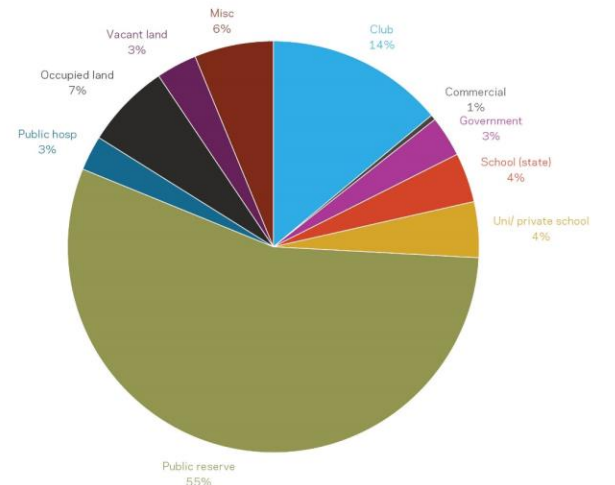
■ High, well-maintained sports fields

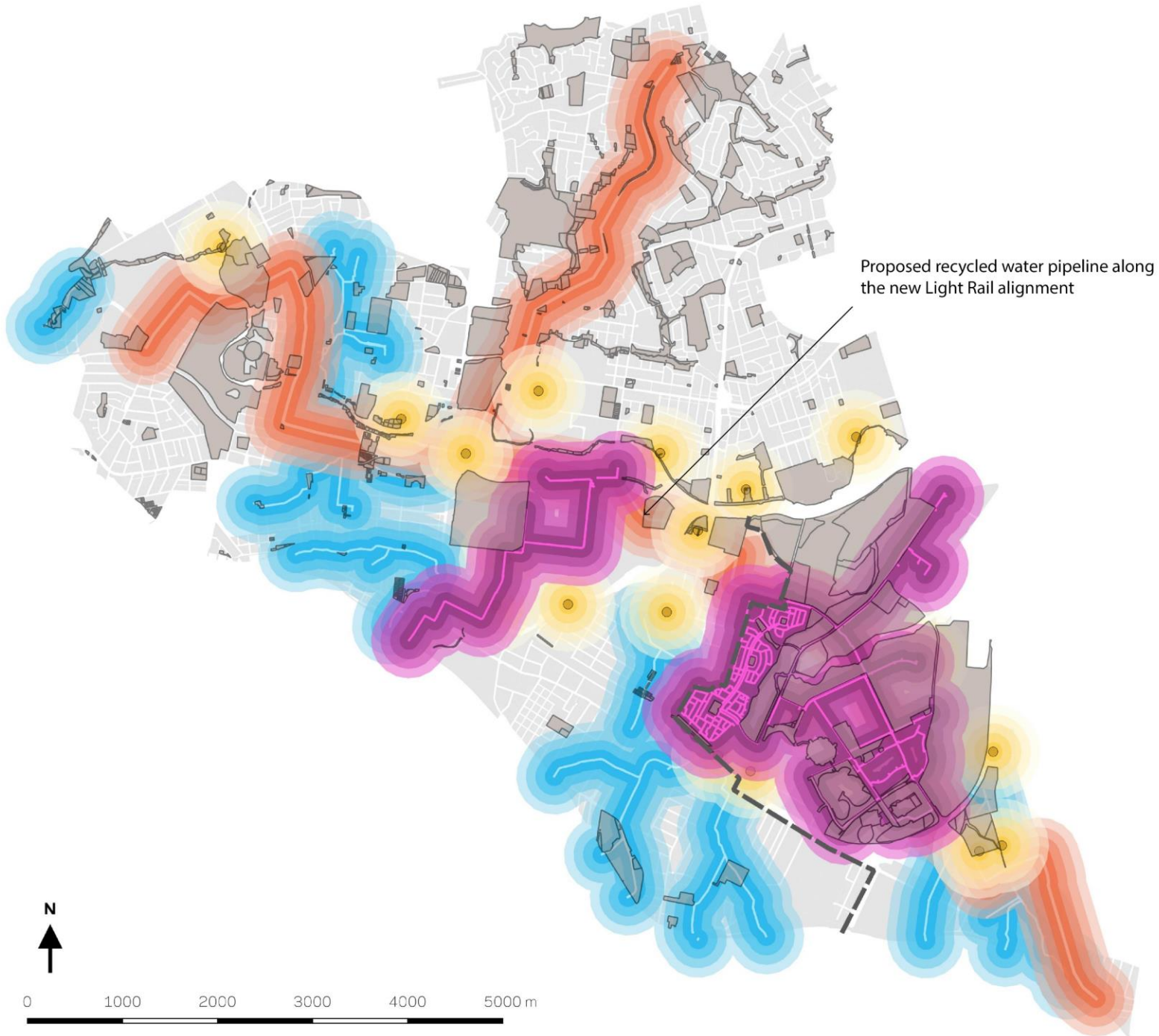
■ Very high, elite sports fields (stadiums)

Greenspace



0 1000 2000 3000 4000 5000 m





Legend

- GPOP Cadastral Database
- Sydney Olympic Park Boundary
- Open Space Areas
- Recycled Pipes
 - BT_GPOP_Recycled_Pipe
 - BT_GPOP_Recycled_Pipe+100
 - BT_GPOP_Recycled_Pipe+200
 - BT_GPOP_Recycled_Pipe+300
 - BT_GPOP_Recycled_Pipe+400
- Sewer Pumping Stations
 - BT_GPOP_SewerPumpingStation
 - BT_GPOP_SewerPumpingStation+100
 - BT_GPOP_SewerPumpingStation+200
 - BT_GPOP_SewerPumpingStation+300
 - BT_GPOP_SewerPumpingStation+400
 - BT_GPOP_SewerPumpingStation+500
- Light Rail
 - BT_GPOP_LightRail_Alignment
 - BT_GPOP_LightRail_Alignment+100
 - BT_GPOP_LightRail_Alignment+200
 - BT_GPOP_LightRail_Alignment+300
 - BT_GPOP_LightRail_Alignment+400
- Stormwater
 - BT_GPOP_Stormwater
 - BT_GPOP_Stormwater+100
 - BT_GPOP_Stormwater+200
 - BT_GPOP_Stormwater+300
 - BT_GPOP_Stormwater+400



Legend

- GOP Cadastral Database
 - SydOlyPark_BoundaryLine
- Irrigation Areas**
- Open Space Areas
 - Within Main Supply Area
 - Outside Strategy
 - Independent Stormwater Harvesting Scheme
- Irrigation Strategy**
- Existing Recycled Pipeline
 - Existing Recycled Pipe
 - 400 m Buffer @ 100 m increments
 - Potential Recycled Water Pipeline via Light Rail
 - Recycled Water Pipeline via Light Rail
 - 400 m Buffer @ 100 m increments
 - Independent Stormwater Harvesting Scheme
 - Potential Stormwater Harvesting Node
 - Stormwater Harvesting Catchment

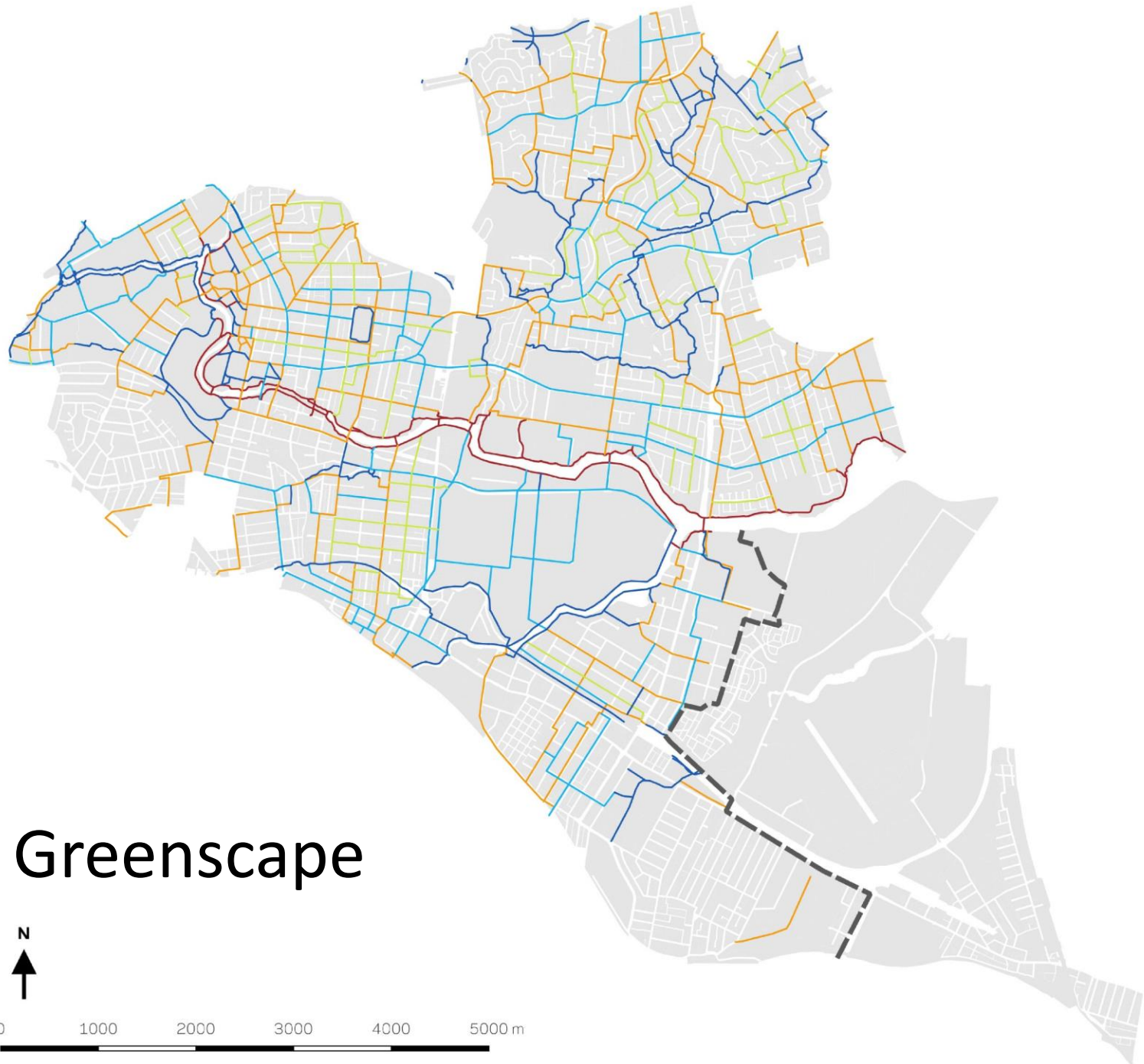
Main distribution lines to follow Light Rail alignment

Treated Water Storage Tank and Distribution Pumps

Olympic Park Excluded (Supplied from WRAMS)

Fairfield RWTP





Legend

- GPOP Cadastral Database
- SydOlyPark_BoundaryLine
- Greenscape - Green Grid
 - Greenlink
 - Intermediate Route
 - Local route
 - Major Routes
 - ParraRiver

Greenscape





SATISFYING
Inspired locally.

REFRESHING
Inspired locally.

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Helping
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private realm public realm



High rise greener (e.g. Milan's Vertical Forest which hosts 900 trees and over 2000 plants distributed in relation to the facade's position towards sun. Image by Mishkabear / CC BY 2.0)



Vine and trellis planting over footpaths (Southbank, Brisbane)



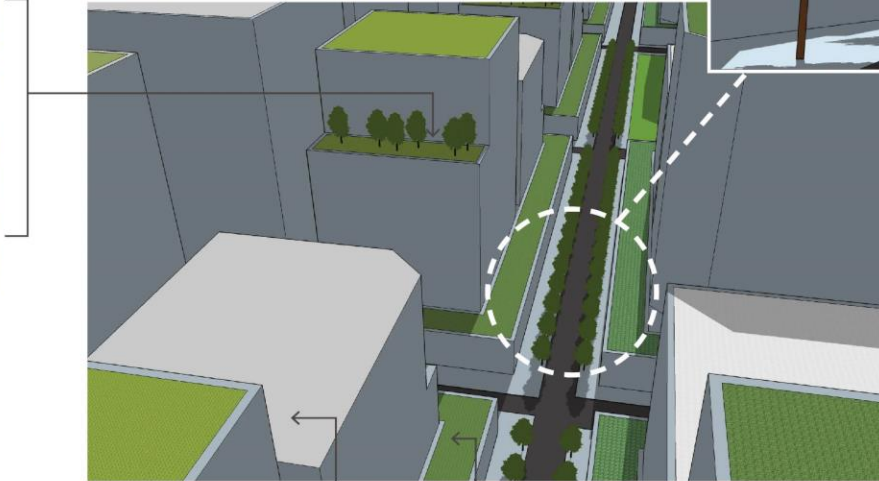
Well-watered street trees, Orchard Road, Singapore



Green walls in public spaces and building atria

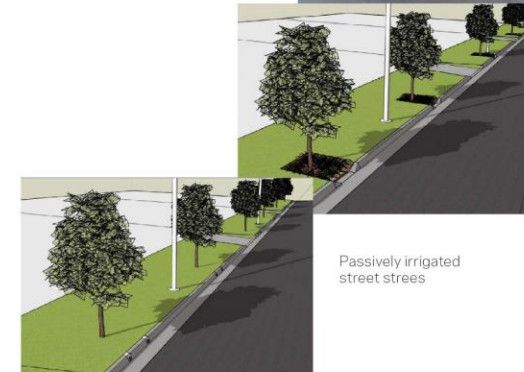


vertical parks

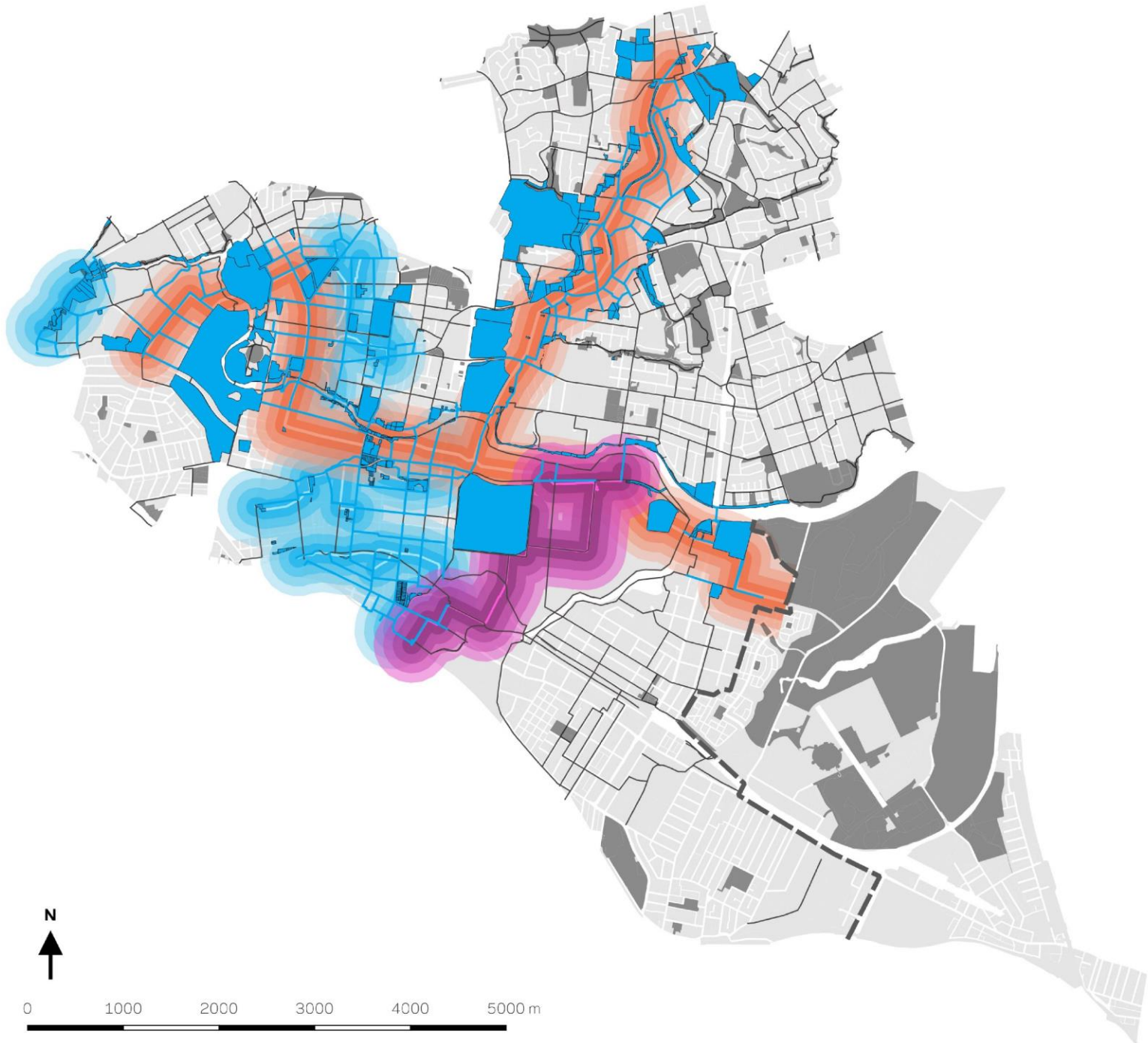


Light coloured roofs for increased albedo (heat reflectance)

Podium planting



Passively irrigated street streets



Legend

- GPOP Cadastral Database
- SydOlyPark_BoundaryLine
- Open Space Areas
 - Within Strategy
 - Outside Strategy
- Greenscape - Green Grid
 - Within Strategy
 - Outside Strategy
- Irrigation Strategy
 - BT_GPOP_Strategy_Sewer_PumpingStation
- Recycled pipe
 - BT_GPOP_Strategy_Recycled_Pipe
 - BT_GPOP_Strategy_Recycled_Pipe+100
 - BT_GPOP_Strategy_Recycled_Pipe+200
 - BT_GPOP_Strategy_Recycled_Pipe+300
 - BT_GPOP_Strategy_Recycled_Pipe+400
- Light rail
 - BT_GPOP_Strategy_LightRail
 - BT_GPOP_Strategy_LightRail+100
 - BT_GPOP_Strategy_LightRail+200
 - BT_GPOP_Strategy_LightRail+300
 - BT_GPOP_Strategy_LightRail+400
- Stormwater
 - BT_GPOP_Strategy_Stormwater
 - BT_GPOP_Strategy_Stormwater+100
 - BT_GPOP_Strategy_Stormwater+200
 - BT_GPOP_Strategy_Stormwater+300
 - BT_GPOP_Strategy_Stormwater+400



0 1000 2000 3000 4000 5000 m

The costs don't really stack up in a traditional dollars per volume sense.....

But GPOP isn't the standard "customer".

And when was anyone suggesting it was water that they were buying?

Economics

Health benefits

- Health benefits associated with physical activity
- Health benefits associated with an increase in tree cover (including heat stress)

Economic benefits

- Increased spend within the City of Parramatta by residents
- Increased worker productivity and reduced worker absenteeism

Environmental and amenity benefits

- Mode share shift
- Environmental benefits of trees
- Amenity benefits of trees
- Environmental benefits of water sensitive urban design
- Amenity benefits of water sensitive urban design

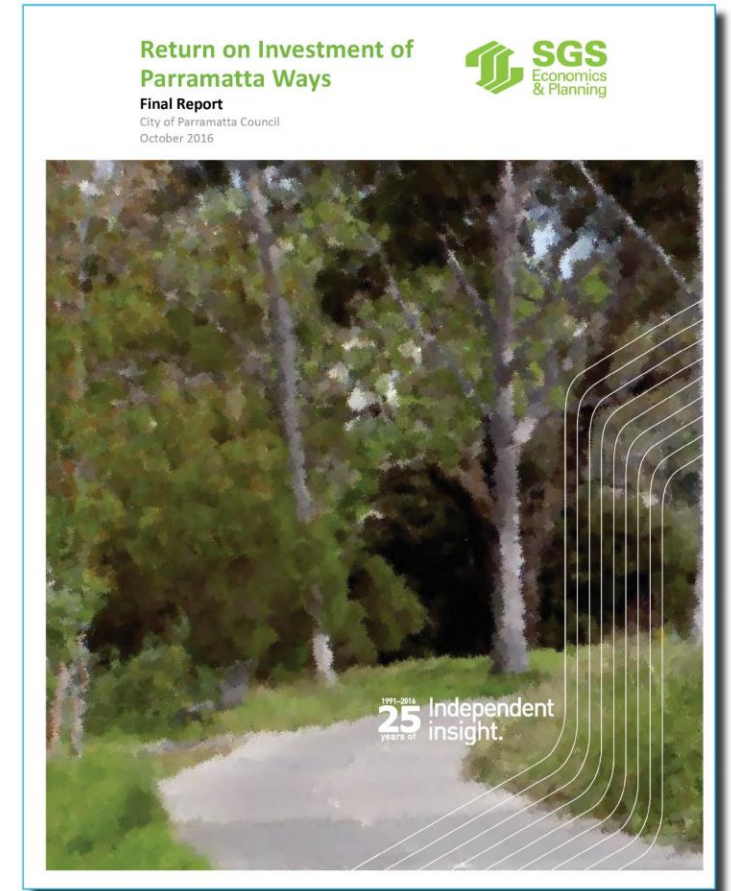
Additional unquantified costs and benefits

- Amenity disruption during construction
- Improved mental health outcomes
- Potential increase in perception of safety and reduction in crime
- Improvements to biodiversity
- Increased visitor spend to the City of Parramatta local government area
- Reputational benefits to the City of Parramatta [and Strathfield and Auburn LGAs]

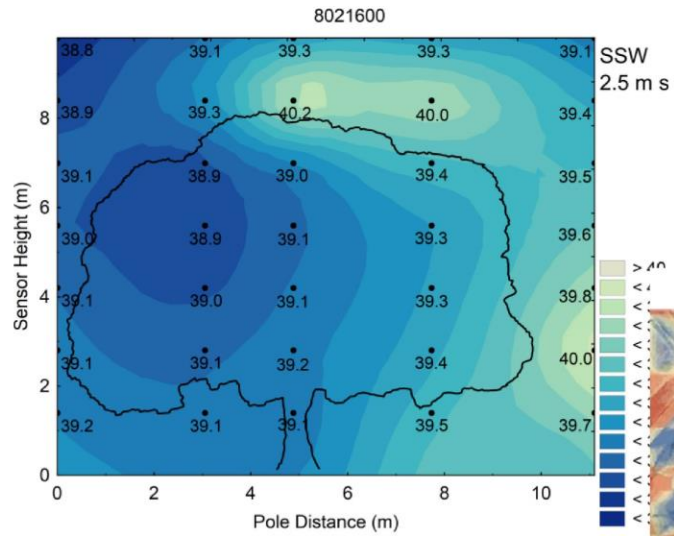


Economics

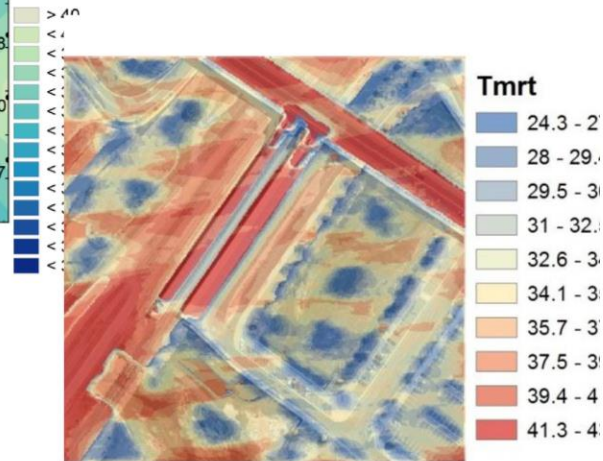
- + The overall Green Grid proposal would result in a Benefit-Cost Ratio (BCR) of 3.74
- + CBR that was calculated by Parramatta Ways did not consider the risk of drought and that green grid is at risk of losing significant value without an irrigation supply.
- + Need a better form of value capture.



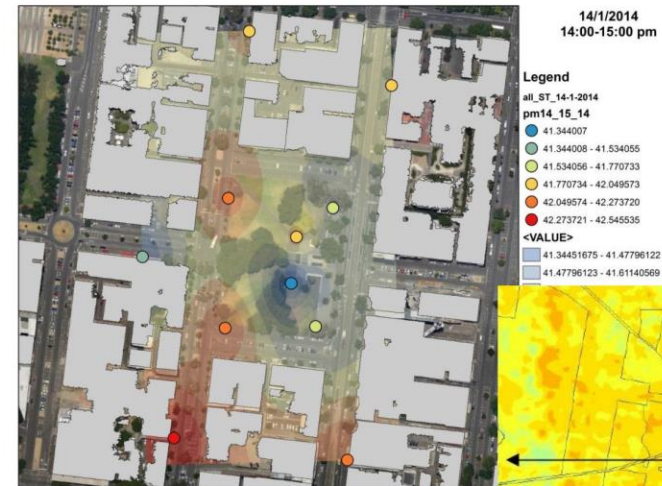
Single tree: 0.6 - 1.2 °C



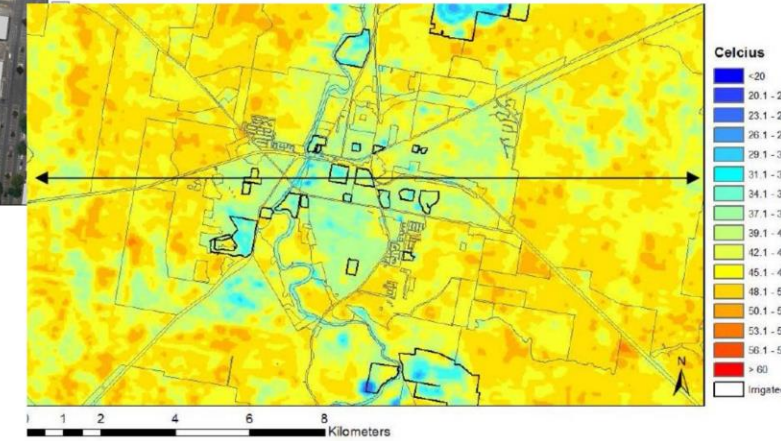
Green Street: Up to 4.8 °C

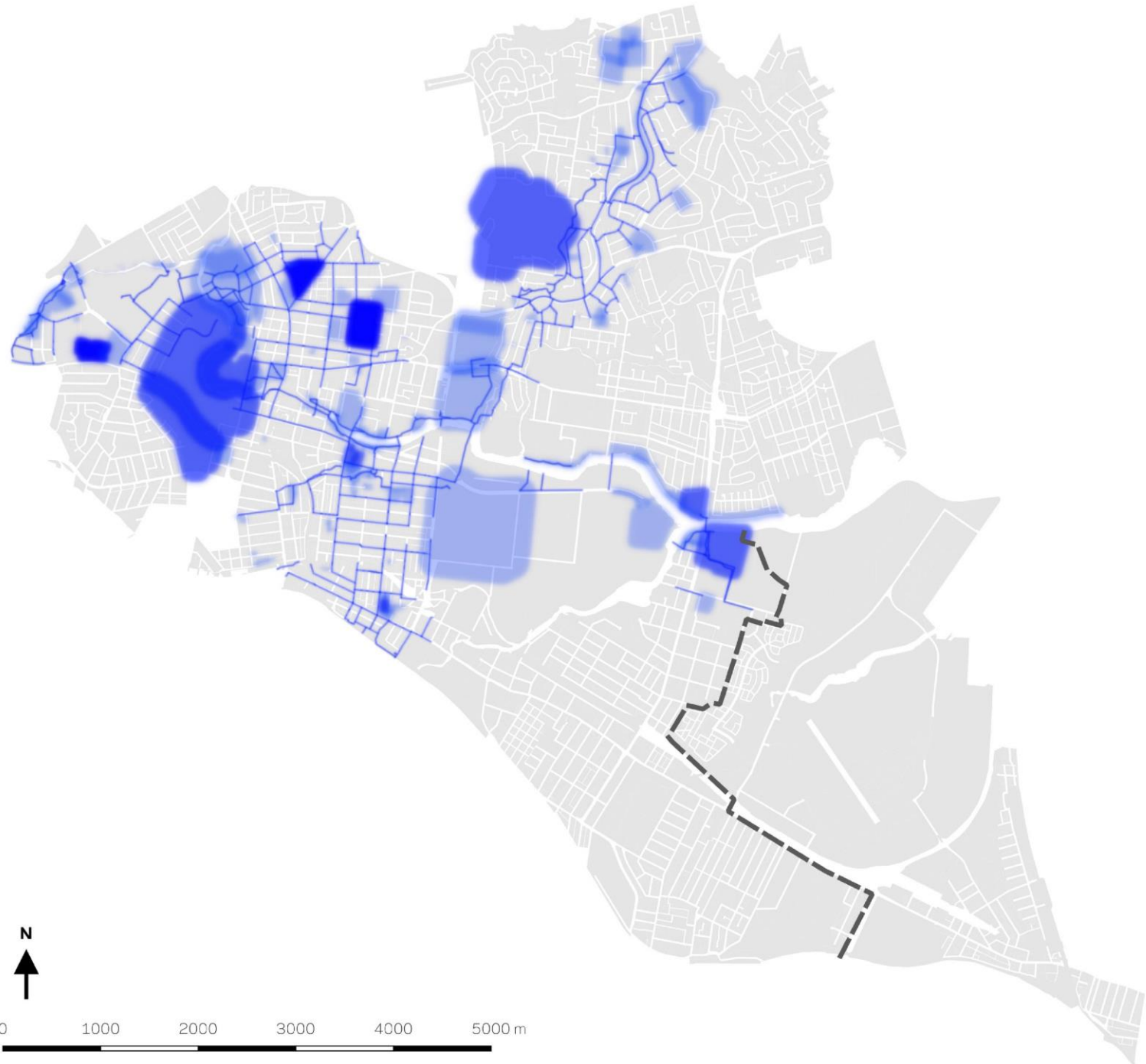


Urban park : 1.2 °C



Precinct: 3 - 5 °C





Legend

■ GPOP Cadastral Database

— SydBlyPark_BoundaryLine

Open Space Cooling

■ Low

■ Medium

■ High

Greenscape Cooling

■ Medium



0 1000 2000 3000 4000 5000 m

Learnings

Water professionals – do the work to understand how to provide the infrastructure. Don't get stuck in least cost per ML mentality.

City Shapers – set more specific vision and detail so that "essential service" can be justified.

|



GPOP