

PENRITH GREEN GRID STRATEGY

Tract

Final Report

Prepared for Penrith City Council

Tract

8/80 Mount Street,
North Sydney, NSW, 2060

Issued
07 October 2021

Quality Assurance

PENRITH GREEN GRID STRATEGY

Project Number
[220-0034-00-L-05-RP01]

Final Report

Revision (see below)
[12]

Prepared for Penrith City Council

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Issued
07.10.2021

Revisions

Rev	Issued	Details	Prepared	Reviewed	Project Principal
00	18 December 2020	Draft Issue for Review	JL	AL	JL
01	22 December 2020	Updated Draft Issue for Review	JL	AL	JL
02	09 February 2021	Ch1-5 Updated with Council comments	JL	AL	JL
03	28 February 2021	Draft Report - Ch6-8 Updated with council comments	JL	AL	JL
04	29 March 2021	Updated Draft Report	JL	AL	JL
05	08 April 2021	Updated Draft Report	JL	AL	JL
06	04 May 2021	Draft Updated Report	JL	AL	JL
07	12 May 2021	Draft Updated Report	JL	AL	JL
08	13 May 2021	Draft Updated Report	JL	AL	JL
09	10 September 2021	Post Exhibition Draft Report	JL	AL	JL
10	27 September 2021	Post Exhibition Draft Report	JL	AL	JL
11	05 October 2021	Post Exhibition Draft Report	JL	AL	JL
12	07 October 2021	Post Exhibition Final Report	JL	AL	JL

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Common Terms and Abbreviations Used In This Report

Term	Definition
CBD	Central Business District
DPIE	Department of Planning Industry & Environment, NSW Government agency
Government Architect NSW (GANSW)	The Government Architect, NSW Government agency, provides strategic design leadership in architecture, urban design and landscape architecture
Greater Sydney Commission (GSC)	<p>The Greater Sydney Commission, NSW Government agency, with specific roles and responsibilities for planning for Greater Sydney.</p> <p>The Commission provides strategic oversight and coordination across government agencies and councils to implement the Greater Sydney Region and District Plans.</p> <p>The strategic plans prepared by the Commission are A Metropolis of Three Cities - the Greater Sydney Region Plan and five district plans. Together these outline a 20 year plan and a 40 year vision to make Greater Sydney more productive, liveable and sustainable for future generations</p>
LEP	Local Environmental Plan provides the basic planning objectives and development controls for each Local Government Area.
LGA	Local Government Area
LSPS	Local Strategic Planning Statement
Metropolitan Rural Area	This is an area which is outside of the planned urban areas and can be considered as peri-urban land. Includes protected public land for conservation as well as rural towns and villages.
North West Growth Area	The North West Priority Growth Area has been designated by NSW Government to plan for and provide homes and jobs in Sydney's northwest forecasted to be needed to meet demand over the next 20 years.
PCC	Penrith City Council
Premiers Priorities	These are priorities which represent NSW Premiers commitment to making a significant difference to enhance the quality of life of the people of NSW.
Protected Natural Area	This is land set aside for conservation and managed by NSW Government agencies. Includes a range of habitats and ecosystems, significant landforms and geographical features, significant Aboriginal cultural heritage sites, and other areas of historic value.
PSRS	Penrith Sport and Recreation Strategy. Penrith City Councils strategic framework for future open space, play, sport and recreation provision over the next 15 years.
SEPP	State Environmental Planning Policy. Prepared by the NSW Government to manage land use and urban and regional development in a state-wide context.

Term	Definition
Sydney Green Grid	Prepared by NSW Government Architects Office. The Sydney Green Grid promotes the creation of a network of high quality open spaces that supports recreation, biodiversity and waterway health. The green grid will create a network that connects strategic, district and local centres, public transport hubs, and residential areas
TfNSW	Transport for New South Wales, NSW Government agency
West District Green Grid (WDGG)	West District focused study as part of Sydney Green Grid. Each district is analysed for its spatial qualities, open space, waterways, its context and key natural features. This data informs a series of strategic opportunities for building the Sydney Green Grid within each of Sydney's 5 districts
Western City District Plan	As one of 5 district plans prepared by Greater Sydney Commission this sets out planning priorities and actions for improving the quality of life for residents in the Western City District. This district covers the Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly local government areas.
Western Economic Corridor	As established by A Metropolis of Three Cities . a Western Economic Corridor is defined with the aim to attract globally significant defence and aerospace activities and contribute to a strong trade, freight, logistics, advanced manufacturing, health, education and science economy.
Western Parkland City	As established by A Metropolis of Three Cities The Western Parkland City will be established on the strength of the new international Western Sydney Airport and Badgerys Creek Aerotropolis. It will be a polycentric city capitalising on the established centres of Liverpool, Greater Penrith and Campbelltown-Macarthur.

The identification and prioritisation of the green grid forms the basis of its implementation and enhancement that will keep Penrith cool, encourage healthy lifestyles, support walking and cycling, provide better access to open spaces, enhance bushland and support ecological resilience.

EXECUTIVE SUMMARY

Council values the unique status of Aboriginal people as the original owners and custodians of lands and waters, including the land and waters of Penrith City.

Council values the unique status of Torres Strait Islander people as the original owners and custodians of the Torres Strait Islands and surrounding waters.

We work together for a united Australia and City that respects this land of ours, that values the diversity of Aboriginal and Torres Strait Islander cultural heritage, and provides justice and equity for all.

Open space is one of Penrith's greatest assets. Our creeks and river waterways, parks and reserves are integral to the character and life of our city.

This Strategy provides the basis for recognising and highlighting the existing green infrastructure (bushland, waterways, open and recreation space), as well as developing opportunities to reinforce this network with new green links. This will encourage the establishment of a comprehensive green infrastructure network, emphasising the importance of the connected ecological systems along with the physical networks.

Establishing the Penrith Green Grid Strategy (The Strategy) is essential for the city and its broader connections within the Western Parkland City.

Penrith is undergoing significant transformation that is being driven by major infrastructure and land use initiatives associated with the Western Sydney Airport and Aerotropolis. The majority of rural lands in the south eastern areas of the Penrith LGA will transition towards urban (residential and employment) and existing urban hubs will increase in density to house a growing population.

The Strategy addresses current and future challenges in prioritising urban greening and waterways, providing connections across existing and planned open space and transport infrastructure; and identifies

implementation locations close to where people live and in locations where higher population growth will be experienced.

The Strategy identifies the objectives and strategic directions for the implementation of the local Green Grid. It develops from the original principles and priority projects established in the Sydney Green Grid.

The Strategy's methodology has identified location specific projects in response to character by understanding existing green cover, open space, heat, walkability, pedestrian generators and destination data. Localised mapping has allowed the examination of existing landscape and infrastructure to reflect the different needs in communities across the city.

Making use of the character features in each precinct, along with a range of other goals, the Strategy will ensure Penrith becomes a more equitable and liveable city which evolves with a genuine sense of place woven throughout.

The Strategy includes the framework to establish, evaluate and prioritise the grid implementation. A number of catalyst and high priority projects have been developed, selected for further study due to their higher ranking against important linking characteristics. These are shared in an appendix to this Strategy document.

The Strategy is the first step in categorising opportunities, needs and challenges for the implementation and management of Penrith's Green Grid. Preserving and enhancing Penrith's green grid is a tangible way in which our community respects and cares for Country and our natural environment.

The Strategy describes the desired future outcomes for Penrith's Green Grid and can be used as a basis for long-term planning, plan-making and development assessment purposes. It is a sub set to Councils Local Strategic Planning Statement and Cooling the City Strategy. While the Green Grid Strategy focusses on public land, responsibility for implementation requires collective commitment and support from private and public landowners, as well as future developers, acknowledging the importance of creating, and maintaining, the Green Grid as an asset for all.

The Penrith Green Grid Strategy will be considered a basis for further strategy work by Council. In particular, while the Green Grid Strategy explores ways to improve and link existing green spaces, additional open spaces to support population growth, especially in urban centres, will be undertaken as part of separate strategic work. The Strategy will become a key component in the implementation of the Western City District Plan.

PENRITH GREEN GRID STRATEGY

CHAPTERS 1 - 3

1. PENRITH GREEN GRID STRATEGY

2. POLICY AND PLANNING FRAMEWORK

3. AIMS & OBJECTIVES

1 PENRITH GREEN GRID STRATEGY

1.1 Introduction

The Sydney Green Grid (Government Architect NSW) establishes the parameters to create a sustainable living green-blue network for Greater Sydney, by taking a whole-of-city approach linking waterways, open space and parklands.

Penrith City Council (PCC) is ensuring that the aspirations of the Sydney Green Grid are embedded into an evolving LGA. The Penrith Green Grid Strategy (The Strategy) will support a vision to strengthen a unique location into a high quality, safe and equitable public domain that reinforces the planned growth of a metropolitan cluster integral to the establishment of Sydney's Western Parkland City.

The Strategy is an opportunity to demonstrate the principles of the Sydney Green Grid through integrating with existing and planned urban development, with the creation of a well-balanced network of built green elements to form the broader city-regional green infrastructure.

The Sydney Green Grid is delivering an interconnecting network of open space that will keep the city cool, encourage healthy living, enhance biodiversity and ensure ecological resilience. Linkages between open spaces are fostered within the wider public realm through enhancing creek corridors, transport routes, suburban streets, footpaths and cycle ways

Sydney Green Grid Government Architect of NSW

Green infrastructure is the network of green spaces, natural systems and semi-natural systems that supports sustainable communities and includes waterways; bushland; tree canopy and green ground cover; parks; and open spaces that are strategically planned, designed and managed to support a good quality of life in the urban environment.

Greener Places Government Architect of NSW

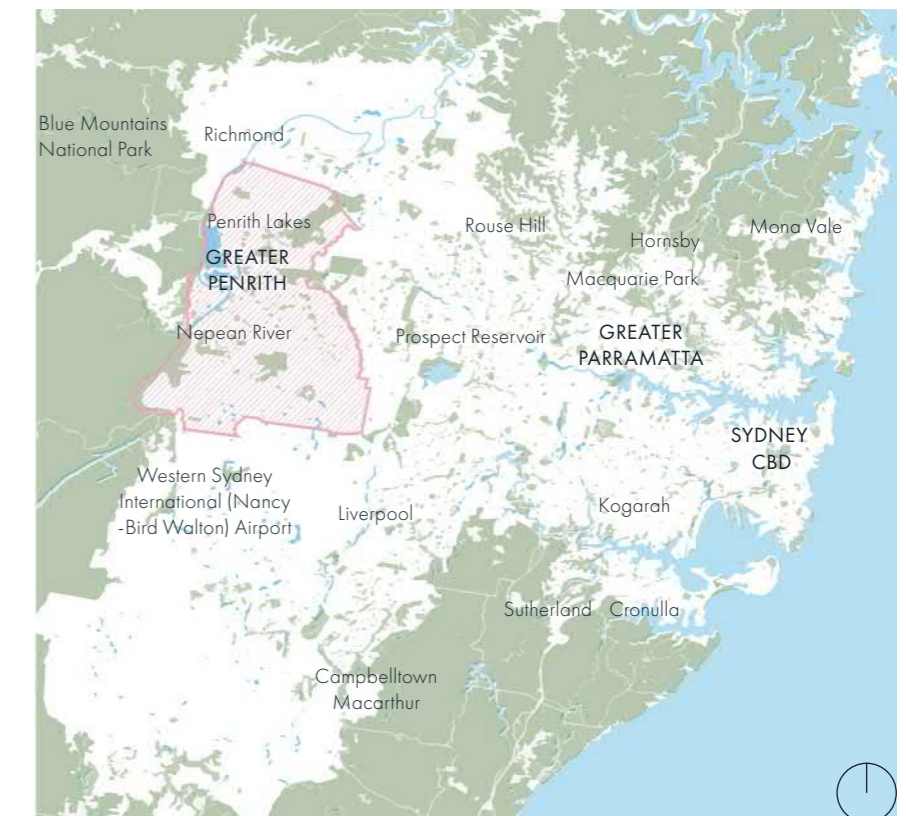


Figure 1. Sydney Context Map

The identification and prioritisation of the green grid forms the basis of its implementation and enhancement that will keep Penrith cool, encourage healthy lifestyles, support walking and cycling, provide better access to open spaces, enhance bushland and support ecological resilience.

1.2 The Strategy

The Strategy creates opportunities for a walkable City connecting Penrith's town centre and neighbourhoods, the Nepean foreshore, waterways, recreational and open space networks through the provision of green infrastructure that will contribute to city cooling, liveability and ecology.

The grid reinforces the network of pathways, cycleways and connects neighbourhoods to open space linkages at the local level.

The Strategy is grounded in a detailed understanding of Penrith's landscape character and focuses on priority areas where people live and work.

The implementation framework ensures a balance between creating a holistic vision while retaining the subtlety and diversity that exists across the City.

The green-blue grid has been developed from existing information which considers current hydrological, ecological, recreational, urban heat and transport data.

This Strategy responds to requirements in the implementation of *A Metropolis of Three Cities* including directions specified in the Western City District Plan and the provision of access to quality green open space identified in the Premier's Priorities for a Better Environment to increase *Greener Public Spaces* and *Greening our City*.

The recommendations support the delivery and maintenance of the Green-Blue Grid and will enable Council to embed grid principles into plans, policies and strategies.

The Strategy provides the first assessment of priority and catalyst projects to embed the Green Grid into the fabric of the local environment, which will form an enduring legacy.

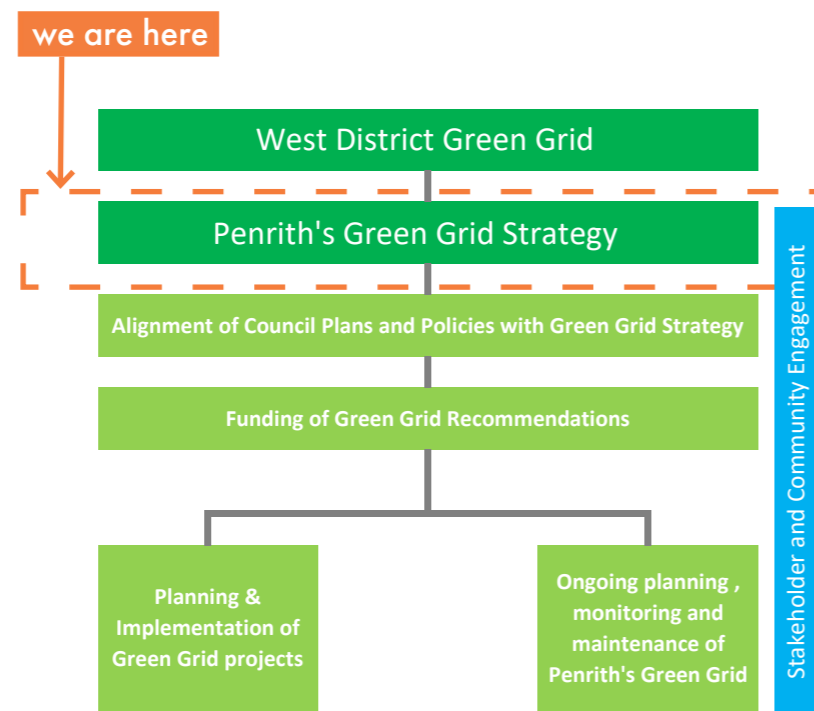


Figure 2. Where we are in the Green Grid process

2 POLICY & PLANNING FRAMEWORK

2.1 Overview

The Strategy is a policy-driven initiative implementing planning objectives to lead transformational change within the City. These include actions being undertaken to achieve outcomes as described in:

At the State/ Metropolitan level:

- *The Greater Sydney Region Plan - A Metropolis of Three Cities* Greater Sydney Commission, adopted by the NSW Government in 2018;
- *Making the Western Parkland City: Initial Place-based Infrastructure Compact (PIC) Area - Draft PIC Report*, Greater Sydney Commission 2020;
- *The Western City District Plan*, Greater Sydney Commission 2018, which provides more localised detail and sets a vision for the emerging Western Parkland City;
- *Sydney Green Grid Spatial Framework and Project Opportunities*, Tyrell Studios on behalf of Office of the Government Architect NSW 2017;
- *Draft Greener Places Design Guide*, Office of Government Architect NSW 2020;
- *Open Space - A 50 Year Vision for Greater Sydney's Open Space and Parklands*, NSW DPIE 2021;
- *White Paper - Parklands for People*, NSW DPIE 2021;

- *Public Space Charter*, NSW DPIE;
- *Draft NSW Public Open Space Strategy*, NSW DPIE;
- *Greater Sydney Outdoor Survey*, NSW DPIE 2019; and
- *Economic Valuation of Green Infrastructure and Public Space*, NSW DPIE.

Further to support these strategies, NSW Premier's Priorities outline the following commitments;

- Greener public spaces - increase the proportion of homes in urban areas within 10 minutes' walk of quality green, open and public space by 10% by 2023; and
- Greening our city - Increase the tree canopy and green cover across Greater Sydney by planting 1 million trees by 2022

At the LGA level:

- *The Penrith Community Plan 2017*, outlining broad strategies to guide Penrith's future and build its resilience over the next 10-20-year period; and
- *Local Strategic Planning Statement 2020*.

The Strategy also relates to, and must be considered in conjunction with a range of other Council policy and strategic documents including *Resilient Penrith Action Plan*, *Cooling the City Strategy*, *Sport and Recreation Strategy*, *Penrith Accessible Trails Hierarchy Strategy*, *East West Corridor Interim Centres Strategy*, *Penrith Development Control Plan*, *Biodiversity and Ecological Strategy* and *Street & Park Tree Management Plan*.

A full list of the policy and strategic documents is included on the following pages *2.2 Background Policy and Strategy*

Embedding the Green Grid

The Strategy brings together a range of Council's adopted planning strategies and action plans. In the short term specific input to ensure the Grid is fully incorporated within future development should be addressed in the planning and scoping documents currently underway. Managing transition will require effective planning, development and decision-making processes to enable strategic directions to be tailored to meet the specific needs of each localised area.

The implementation of the Strategy will need to be incorporated into Council's Delivery Program, and annual Operational Plan. Recommendations and actions for implementation are described in Section 7 *Delivering Penrith's Green Grid Strategy*.

2.2 Background Policy & Strategy:

Background document review

A detailed background document review was undertaken to provide a consolidated source of local and state government strategic planning policy information relevant to the Penrith Green Grid.

A review synthesis document was prepared as a high level summary to inform the development of the strategy, *Penrith Green Grid Strategy Background Literature Review, Tract, September 2020*.

List of documents reviewed:

- *Western City District Plan (2018)* – Greater Sydney Commission
- *Greener Places (2020)* – Government Architect of NSW
- *Greener Places Draft Design Guideline (2020)* – Government Architect of NSW
- *Connecting with Country Draft (2020)* – Government Architect of NSW
- *Community Strategic Plan (2017)* – Penrith City Council
- *Local Strategic Planning Statement (March 2020)* – Penrith City Council
- *Draft Penrith Local Housing Strategy (September 2019)* – Penrith City Council
- *Penrith East-West Corridor Interim Centres Strategy (April 2020)* – Penrith City Council
- *Penrith Sport and Recreation Strategy (2020)* – Penrith City Council
- *Collaboration Area: Greater Penrith Place Strategy (July 2019)* – Greater Sydney Commission
- *Making the Western Parkland City: Initial Place-based Infrastructure Compact (PIC) Area Draft PIC Report (2020)* – Greater Sydney Commission
- *New West: The Edge Of Tomorrow (August 2019) & Penrith Progression: A Plan For Action (2015)* – Penrith City Council & Hames Sharley
- *Penrith Accessible Trails Hierarchy Strategy (Paths) (June 2012)* – Penrith City Council
- *“Our River” Nepean River Master Plan (Clouston Associates, November 2013)* – Penrith City Council
- *Waste Water Urban Design (WSUD) Policy (December 2017)* – Penrith City Council
- *Street And Park Tree Management Plan (2017)* – Penrith City Council
- *Penrith Cooling the City Strategy (2015)* – Penrith City Council
- *Resilient Penrith Action Plan 2021-2030* – Penrith City Council
- *Penrith Scenic & Cultural Landscapes Study (September 2019)* – Penrith City Council

- *Draft Penrith Rural Lands And Villages Strategy (August 2019)* – Penrith City Council
- *Pulse Of Greater Sydney (July 2019)* – Greater Sydney Commission
- *The Great West & Great River Walks*

Related Penrith City Council Documents

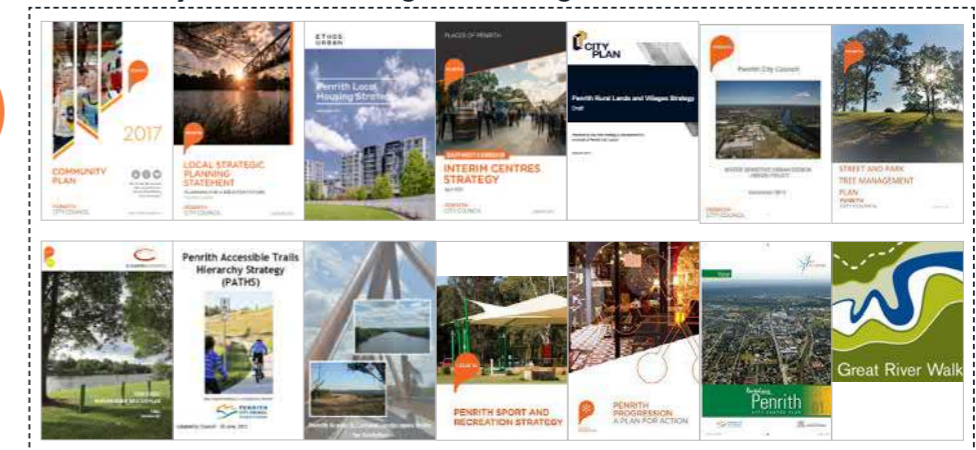
The Penrith Green Grid Strategy also relates to, and must be considered in conjunction with other Council policy and strategy documents:

- *Penrith Progression: A Plan for Action 2015*
- *Section 94 Development Contributions Plans*
- *Water Sensitive Urban Design Policy 2013*
- *Penrith City Centre Public Domain Masterplan 2013*
- *Queen Street Streetscape Improvement Plan 2013*
- *Penrith Development Control Plan*
- *Biodiversity Action Plan 2008*
- *Planning for an Ageing Community Strategy 2010*
- *Advocacy Program*

NSW Government Sydney Metropolitan Strategic Planning



Penrith City Council Strategic Planning - Current



Penrith City Council Strategic Planning

- *Penrith Green Grid Strategy*
- *Updated Local Housing Strategy*
- *Employment Lands Strategy*
- *Rural Lands and Villages Strategy*
- *Corridors and Centres Strategy*

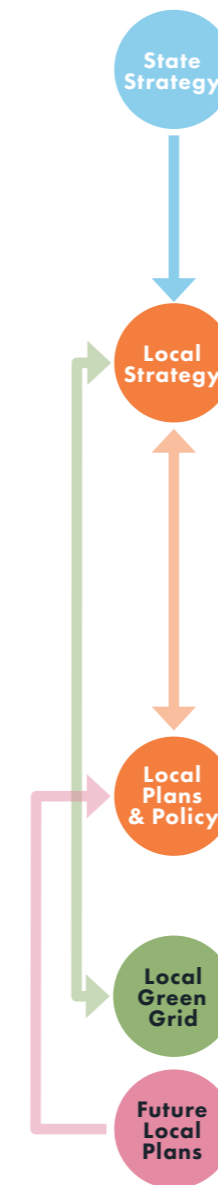


Figure 3. Planning Instruments and Mechanisms Identified in Implementing the Penrith Green Grid

2.3 Local Strategic Planning Statement

Penrith's *Local Strategic Planning Statement (LSPS)* sets out the 20-year vision for land-use in the local area, the special character and values that are to be preserved and how change will be managed into the future.

The *LSPS* identifies the strategic planning work needed to realise this vision in the form of studies and strategies. The Planning priorities that have been identified as relevant to the *Penrith Green Grid Strategy* are summarised here.

Planning Priority 12: Enhance and grow Penrith's Economic Triangle, Planning Priority 13: Reinforce 'The Quarter' as a Specialised Health, Education, Research and Technology Precinct

The LSPS identifies Penrith's Economic Triangle as a planning priority as well as the 'The Quarter' as a Specialised Health, Education, Research and Technology Precinct. The Quarter is a collaboration of the leading health and education providers spanning 300ha between Penrith and St Marys.

Already a major employment hub with over 6,000 jobs, the number of jobs in The Quarter is expected to double by 2026 to more than 12,000.

The collaboration area focus will drive diversification within The Quarter and surrounding places included in the collaboration area approach including, the Penrith City Centre, Nepean River and Penrith Lakes.

These existing urban areas will experience urban renewal and future growth. Governance is required to ensure that the green grid is locked in place as a priority and respected in future development.

Planning Priority 14: Grow Our Tourism, Arts and Cultural Industries

The tourism sector strategies are developing the visitation which contributes significantly to the local economy. The arts and cultural industries developing and the Green Grid plays an important role in linking key cultural and art locations.

Penrith is a destination and the natural assets provide land and water-based recreation, and a variety of soft and hard adventure sports which are directly integrated with the Green Grid.

Planning Priority 16: Protect and Enhance Our High Value Environment Lands

An immediate action is to collaborate with Infrastructure NSW, other State agencies, water service providers and councils on the South Creek Corridor Project to improve the management of water quality and quantity in the Corridor and implement through planning and development controls, where required.

The Greater Sydney Region Plan's vision for the South Creek corridor is to form the spine of the Western Parkland City, with a green corridor that provides an open space recreation network with improved water quality that is biologically diverse.

Planning Priority 18: Connect Our Green and Blue Grid

The preparation of a Green and Blue Grid Strategy (this Strategy) is identified as an immediate action to support green infrastructure that delivers multiple social, environmental and economic benefits.

Short to medium term actions include the review of mapping, planning and development controls and the investigation of funding opportunities for new open space to support the green and blue grid. This builds on other projects and strategies such as Council's Our River Master Plan; Cooling the City Strategy, and Sport and Recreation Strategy.

The protection of existing bushland and urban trees from increased development; providing connections across existing and planned transport infrastructure; and funding new green spaces in locations close to where people live, particularly with the long-term trend towards higher density housing will be a focus of the Green Grid's implementation.

Planning Priority 21: Cool Our City

Council developed the Cooling the City Strategy to take action in cooling down the city. Immediate actions identified in the LSPS include:

Developing a Penrith Resilience Strategy and introducing objectives, planning and development controls to deliver a cooler city; and

Developing canopy targets and identifying suburbs (new, existing and future) where there are opportunities for increasing canopy targets and increased presence of trees in the city.

2.4 Cooling the City Strategy & Urban Heat Island Effect

Penrith is located within the Sydney Basin and edged by the Blue Mountains to the west.

Coastal breezes do not reach Penrith and the area experiences high levels of extreme heat, low rainfall and very cold winters.

Air temperatures in Sydney are expected to increase in the future as a result of climate change and increasing urbanisation.

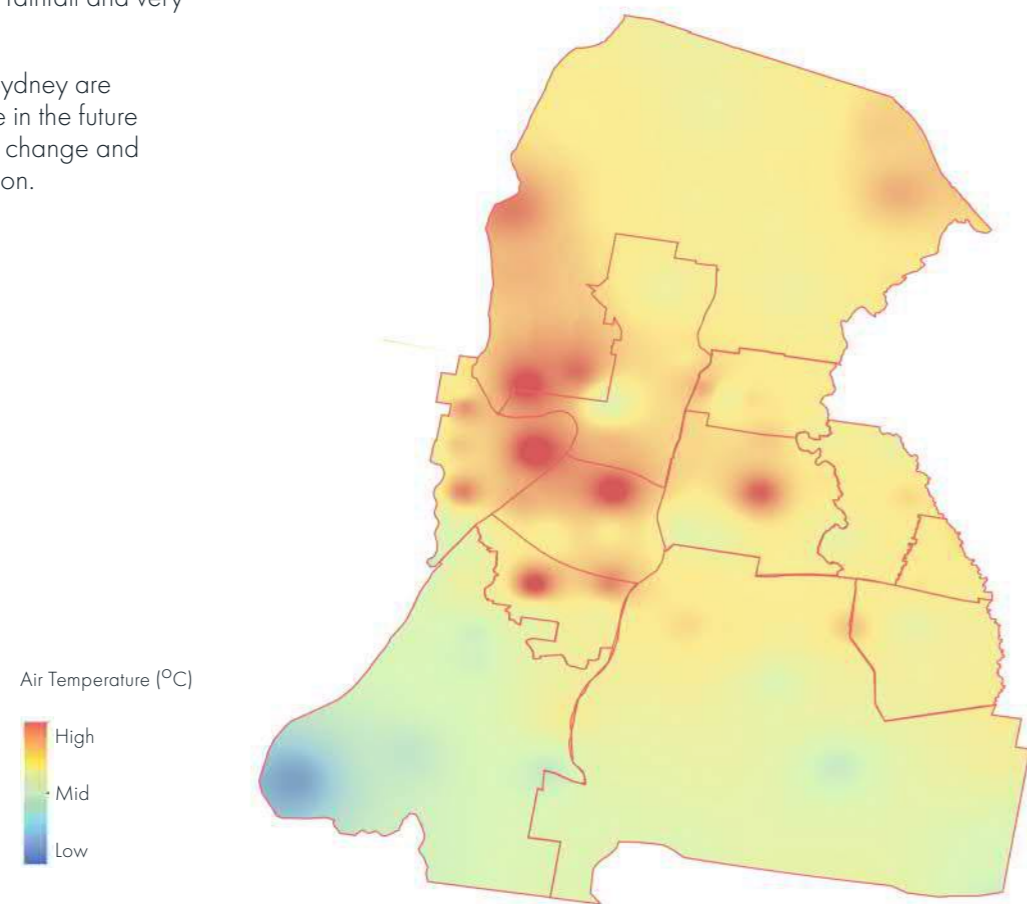


Figure 4. Maximum air temperature in the suburbs of Penrith (between 14 December 2019 and 29 February 2020)
Air temperature data © S. Pfautsch Western Sydney University

Cooling the City

The Penrith area is particularly challenged when it comes to green cover and urban heat. It has low levels of green cover and canopy and is home to communities who are particularly vulnerable to the impacts of heat on their health and liveability. Heat has been well recognised within the local government area as an issue that requires attention. *Resilient Penrith Action Plan 2021-2030* acknowledges the urgency and vulnerability of the city to a changing climate. *Cooling the City Strategy* August 2015 sets the approach to achieve the outcomes identified by the community.

Cooling the City Strategy Objectives and Principles informing the Green Grid:

Objectives

- to **maximise** community awareness and understanding of the effects of heat and the importance of cooling the Penrith LGA.
- to **encourage** greater appreciation of green infrastructure and green spaces in the LGA and their cooling benefits to implement the identified actions within the Strategy giving priority to heat vulnerable areas.
- to **identify** ways to adapt existing projects and activities that will work towards cooling the Penrith LGA, and identify new projects.

Principles

- Community engagement – work with the community to build a shared vision for a cool liveable city.
- Collaboration – work closely with internal and external stakeholders for maximum leverage and from the earliest stages of project development.
- Sustainability – consider the long term implications of decision making in terms of inter- and intragenerational equity, and consider the precautionary principle in project decision making.
- Efficiency – look for opportunities to refine existing projects and activities to meet the objectives of this Strategy.

Urban heat effects

The *Benchmarking Summer Heat Across Penrith*, study identified the risk of heat on public health is greatest around two clusters in the central section of the LGA where population density is high. These clusters are within the CBD of Penrith towards Kingswood and in the east around Colyton and Oxley Park.

Suburbs undergoing development should adopt Council's objectives and principles for mitigating the effects of urban heat and to maximize green cover. Implications and recommendations of the *The Benchmarking Summer Heat Across Penrith* report include:

1. Reduce the area of hard surfaces in the central section of the LGA. This applies especially to the urban cores of Penrith and St Marys. Substantial Urban Heat Island effects have been identified for both commercial hubs.
2. If replacing hard surfaces is not possible, introduce trees for shading car park surfaces.
3. Limit the area of hard surfaces in new development to an absolute minimum.
4. Inclusion of objectives and controls in DCP/LEP for carparks including shading and light coloured surfaces.
5. Concentrate cooling efforts in St Marys on the hottest areas. These are the area in front of the train station and the carparks between Queen Street and East Lane.

3 AIMS & OBJECTIVES

3.1 Aims

To develop a comprehensive Green Grid Strategy for Penrith that supports the creation of a healthier, more liveable, productive and sustainable Western Parkland City in line with the NSW's Premier's Priorities, and the *Greater Sydney Region Plan – A Metropolis of Three Cities*. The Strategy will aim to deliver the Premier's Priorities of quality greenspace within 10 minutes' walk of people's homes, to increase overall canopy cover and reduce the urban heat island effect in line with the Greater Sydney Commission's objectives, and to prioritise actions across the LGA.

Penrith's Green Grid falls generally into three broad categories:

- Open space for recreation: Promote Green Grid for people for improved and accessible public open space
- Improved urban tree canopy: Green Grid for climate adaptation and resilience to increase urban tree canopy to support improved amenity, comfort for local park users, and for walking and cycling
- Emphasise connections to bushland and waterways: green-blue grid infrastructure for habitat and ecological health to improve the connectivity between bushland, recreation space and waterways to support habitat and the connection of people to nature within a sustainable environment.

The Strategy will:

- Understand the scope, characteristics and quality of the existing and potential green-blue grid (including green infrastructure) in the Penrith LGA.
- Identify and evaluate the local green-blue grid and also identify green infrastructure priority projects.
- Localise the green-blue actions identified in *Greater Sydney Region Plan & the Western City District Plan* (including 'A City in its Landscape' Objectives and Planning Priorities W12 through to W18).



Figure 5. Greater Sydney Region Plan & the Western City - Objectives and Planning Priorities W12 through to W18

3.2 Objectives

The objective of the Strategy is to identify and support the delivery and maintenance of the Blue-Green Grid by enabling Council to embed green-blue grid principles into Council plans, policies and strategies.

Specifically the Green Grid complements and supplements the many Council published studies and strategies to assist Council to respond effectively to the challenges and opportunities of growth and change.

The *LSPS* Planning Priorities that have been identified as relevant to the *Penrith Green Grid Strategy* are summarised in the previous section 2.3.

These align with the actions and goals associated with the implementation of the Green Grid.

These are embedded into the Strategy with the following:

- The creation of a LGA wide plan that connects a green-blue grid with a strategic approach. The green-blue grid will strengthen hydrological, ecological, recreational, cycling and walking connections.
- Identification of how to embed green-blue grid principles and delivery of green infrastructure into Council plans, policies and strategies.
- Identification of instruments and mechanisms that can currently be used, or need to be changed, to implement and maintain the green-blue grid and green infrastructure.

- Identification of priority actions, initiatives and projects in an implementation plan for Council to deliver elements of the green-blue grid and green infrastructure over the short, medium and long term.
- The provision of priority and catalyst project descriptions and scopes for Council to deliver over the next ten years.

4 BACKGROUND & CONTEXT

4.1 Strategic Background and Context: Western Parkland City

The Western Parkland City is an area of unique heritage and extraordinary natural and cultural assets. The City is framed by the region's Protected Natural Area and Metropolitan Rural Area. Its extensive rural areas include agriculture and mineral resources that supply the region with fresh local produce and construction materials.

The Western Parkland City is being established on the strength of the Western Sydney Airport and Badgerys Creek Aerotropolis. It will be a polycentric city capitalising on the established centres of Liverpool, Greater Penrith and Campbelltown - Macarthur. The Western Parkland City Authority's vision for the Western Parkland City maximises the use of a 24/7 airport, delivers a connected 30 minute city, with outstanding recreational, cultural and tourism destinations and high quality open green and blue spaces.

Land use and transport will be structured to deliver the Western Parkland City and new city-shaping transport will include:

- Sydney Metro Western Sydney Airport from St Marys, (tunnel to Orchard Hills) to the Western Sydney Airport and Badgerys Creek Aerotropolis.
- Future northern Sydney Metro link to Tallawong.

- Outer Sydney Orbital with connections to Greater Newcastle, Wollongong and Canberra.
- M12 Motorway to connect The Northern Road, Cecil Hills and the M7.
- Western Sydney Freight Line from the Outer Sydney Orbital near Luddenham to the M7 Motorway.
- South West Rail Link Extension from the Aerotropolis through Kelvin Park and Rossmore to the suburban rail network at Leppington.

A Western Economic Corridor will attract globally significant defence and aerospace activities and contribute to a strong trade, freight, logistics, advanced manufacturing, health, education and science economy. This will produce knowledge-intensive jobs close to areas of high population growth and drive the development of the corridor and the metropolitan cluster. The city will include housing diversity around centres and transit nodes.

A future investigation area from Greater Penrith to Eastern Creek will link existing areas and major infrastructure. The Greater Sydney Green Grid is a core element of the amenity of the Western Parkland City. At a strategic level, as part of the Blue grid, South Creek provides a spine for the Western Parkland City.



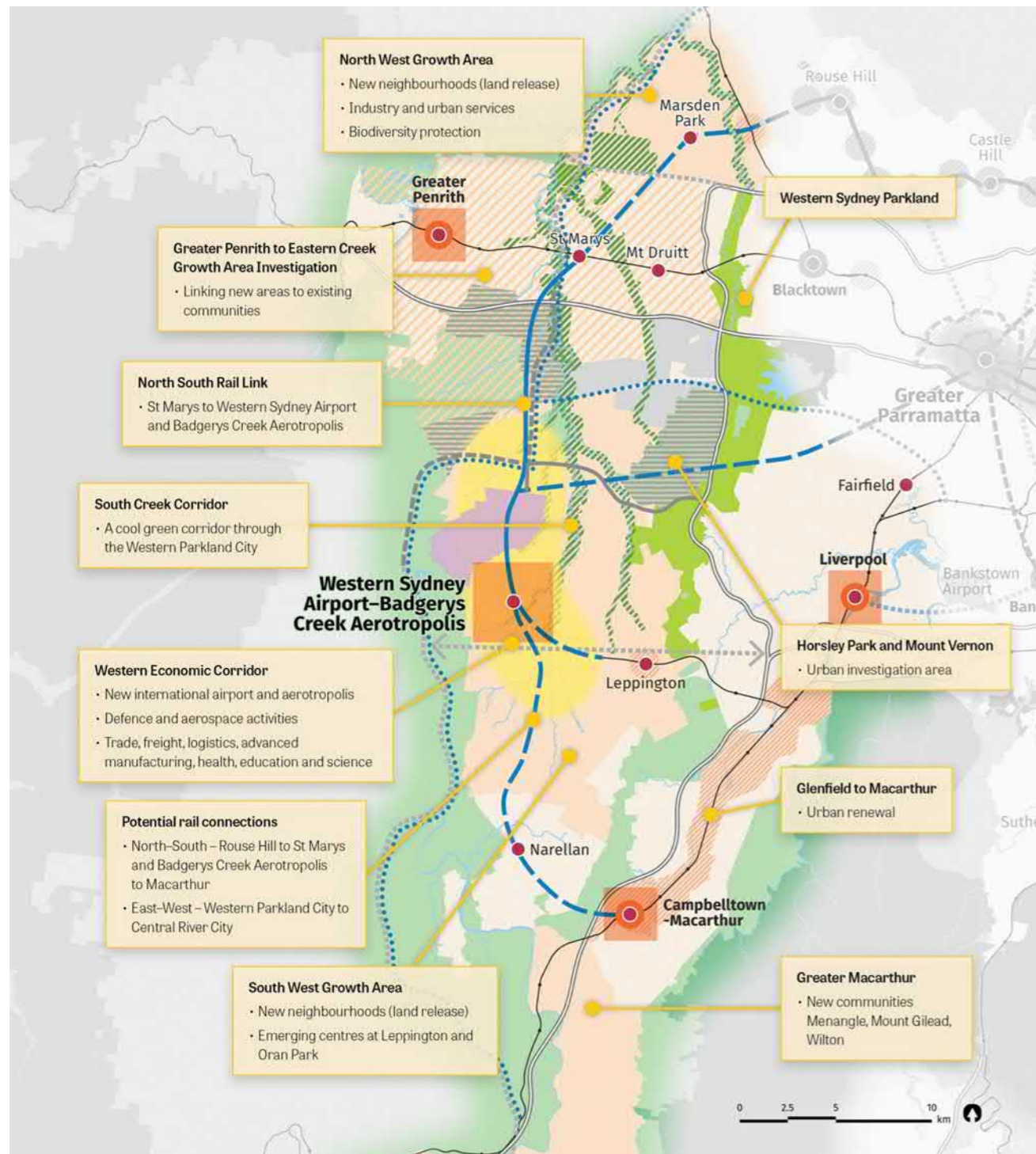


Figure 6. Western Parkland City Vision, Greater Sydney Commission

4.2 Local Background & Context: Penrith Local Government Area

The Penrith Local Government area is 404.9km² in extent and located 50km west of the Sydney Central Business District on the banks of the Nepean River and outskirts of the Cumberland Plain. The significant change and projected population growth for the Penrith LGA will generate an increased demand for jobs, services, housing and recreation opportunities. Council is planning for the LGA's population to grow from 201,600 in 2016 to approximately 260,000 in 2036. More recently however, increased population forecasts have been suggested by the NSW Government for the LGA. Irrespective of the total population of the LGA, there will be an increased demand for jobs, services, housing and recreation opportunities.

Areas east of the Hawkesbury-Nepean River are transitioning from traditional rural or village settings to higher population densities. This presents opportunities and challenges for creating a variety of open space and recreation facilities within reasonable distances from where people live.

Nepean River

The Nepean River flows through Penrith to become the Hawkesbury River and forms the natural western edge of much of the LGA.

Many initiatives are being planned to enhance the open space and public domain in and around Penrith and to provide better connections to and across the Nepean River.

Large scale sites such as the Penrith Panthers, Fernhill Estate and Penrith Lakes have the potential to provide a focus of regional assets for the district and beyond. A number of initiatives already reflect the strategic objectives of the Sydney Green Grid. For example, the *Our River Nepean River Master Plan* and the recent construction of the Yandhai Nepean Crossing uphold the principle of increasing public access linking to *The Great River Walk* (section 4.4), along the foreshore and providing a variety of open space, recreation opportunities and active living connections.

South Creek

South Creek is a tributary of the Hawkesbury River and drains a 414 km² catchment in Western Sydney extending from its headwaters near Narellan in the south, to its confluence with the Hawkesbury River near Windsor. A major tributary of South Creek is Ropes Creek that is within the Penrith City Council LGA. Minor tributaries include Werrington, Claremont, Blaxland, Cosgroves and Badgerys Creek.

The South Creek corridor will be a regionally significant green-blue element for the Western Parkland City.

Linking South Creek and its tributaries (Blue Grid) by improving pedestrian/ permeability / access to our local neighbourhoods will help mitigate the urban heat island effect and manage flows of stormwater. There is a similar opportunity for Ropes Creek to be a catalyst for this. The relationship of riparian vegetation, habitat and waterways is important and multifaceted in that it also provides water quality and amenity outcomes.

Transport, Walking and Cycling

Major infrastructure projects provide opportunities to improve connections to existing open space or provide open space along with infrastructure delivery. New and existing metropolitan clusters and strategic centres will require connection and improvements in public transport. Initiatives in the provision of improved access to the Nepean River and South Creek forms an important starting point for the implementation of Penrith's Green Grid Strategy.

The walking and cycling network is a current priority to be developed for Penrith LGA. At the moment there is a series of footpaths, shared paths and separated pathways which are integrated with the green grid, which together can support a coordinated focus on connecting both networks.

Transport for NSW is establishing a bicycle network hierarchy in collaboration with Council. Through the Council Partnership Program, the NSW Government will invest in The Principal Bicycle Network and improve cycling access within ten kilometres of metropolitan clusters and five kilometres of strategic centres. The Principal Bicycle Network will establish a network of high quality, high-priority bike corridors across Greater Sydney to facilitate safe and direct connections to centres. In addition to supporting longer distance cycling journeys, the individual components have an important role in supporting shorter distance journeys that people make around centres and local areas.

The network will also form part of Greater Sydney's Green Grid, connecting open spaces with centres and residential areas.

Prioritising safe cycling for short trips to centres, transport interchanges and local services such as schools and health services will free capacity for people who need to travel further by road and public transport.

Penrith's regional and local routes will facilitate a seamless and connected network within urban areas. Local streets will connect to these routes to provide door-to-door access for cycling.

Walking is a fundamental part of active living providing health and social benefits. Pleasant and safe environments for walking and cycling contribute to great places. Walking is also a fundamental component of the transport system and most journeys start and end with walking.

The walking and cycling network forms a key layer in Penrith's Green Grid Strategy.

Green Infrastructure – Urban Tree Canopy, Ecological Lands, Recreational Open space

Penrith's green layer of urban trees, recreational open spaces, hydrological corridors and ecological lands offers the opportunity to create a network of diverse places. Analysis of canopy cover across Penrith indicates there are low levels of cover across much of the urban areas, this is particularly notable in urban areas with higher density/more populated areas.

The Penrith Sport and Recreation Strategy identifies 1200 hectares of open space and is a comprehensive outline of the future provisions for sport, recreation and open space facilities across the City.

Access to open space and links to key ecological lands which are managed by National Parks and Wildlife Services including Castlereagh Nature Reserve, Agnes Banks Nature Reserve, the Cranebrook to Windsor Downs Nature Reserve corridor, Wianamatta Nature Reserve corridor and Mulgoa Nature Reserve will ensure a connected network of open space.

There are opportunities to provide new open space along waterways and transport corridors and plan for open space in new neighbourhoods as well as reinforcing Penrith's Biodiversity Strategy to strengthen ecological communities and support landscape-scale biodiversity conservation and the restoration of bushland corridors and remnant vegetation as green infrastructure.

Penrith Lakes

The Penrith Lakes site (1935 hectares) is located on the floodplain of the Nepean River. The Lakes provides an opportunity to focus on the regeneration of landscape, cultural and economic values and has the potential to provide important tourism, recreation, employment opportunities for the City and Western City District.

The Penrith Lakes site enjoys extensive frontage to the Nepean River and has an opportunity to provide connections between the River, Penrith City Centre and surrounding communities.

Penrith Lakes Whitewater Stadium, Sydney International Regatta Centre connections are identified as Sydney Green Grid and Penrith Sport and Recreation Strategy priorities.

Advocating for the development of Penrith Lakes as a regional park and reinforcing linkages to the Great River Walk, Castlereagh, Cranebrook and Penrith is a key component of this Strategy.

PENRITH'S GREEN GRID

4.3 Regional Network: Great West Walk

The Great River Walk

The vision for the Great River Walk is for a 570km walk along the Nepean and Hawkesbury River linking Broken Bay to Lake Bathurst, south of Goulburn. It is an important feature of Council's Nepean River Masterplan. The existing walking track includes a popular and well used six kilometre loop along the river frontage incorporating the Yandhai Nepean Crossing and accessible from Penrith and Emu Plains Railway Stations. The Nepean River is identified as a priority opportunity in the West District Grid.

The Great West Walk

Is a 65km walking route extending from Parramatta to the base of the Blue Mountains that traverses Cumberland Plain Woodland, river systems, public parklands, significant heritage sites and urban places. Walk highlights within Penrith include Wianamatta Regional Park and the Nepean River, connecting to the Great River Walk.

The route should be developed as a component of the Green and Blue Grid to reinforce local loops and broader recreational walking trails including connections to Fernhill Estate.

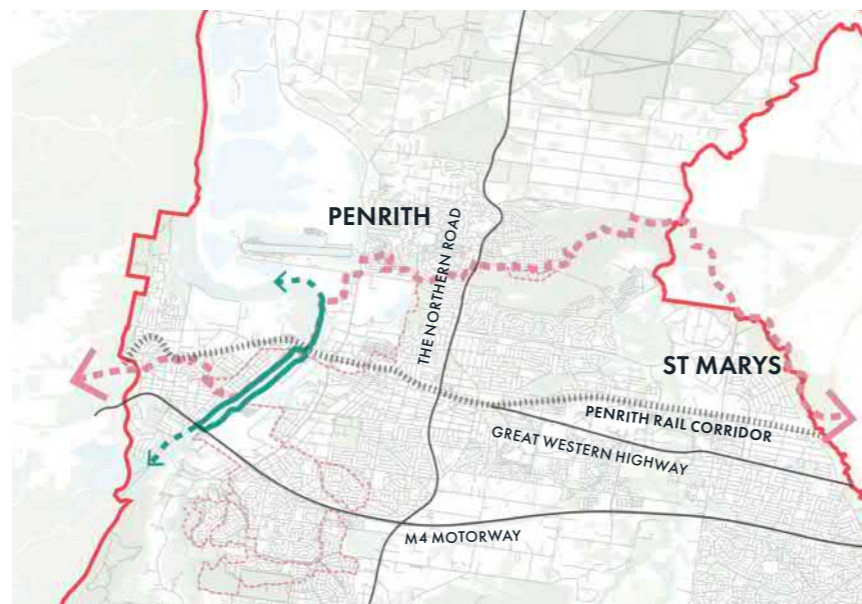


Figure 7. Great River Walk Map, Source Google Maps Walking Volunteers 27 July 2020



5 PENRITH'S GREEN GRID

5.1 Taking the Green Grid to the Local Level, Understanding Place

The Penrith Green Grid Strategy builds on the principles of the Sydney Green Grid by identifying projects and ranking their importance according to local needs and priorities. Sydney Green Grid included district specific spatial framework and project opportunities, the relevant district framework being the West District Green Grid.

The Penrith Green Grid has been aligned with community well-being by focusing on locations of population density as higher priority to support sustainability goals identified in Penrith's LSPS. The Strategy identifies project opportunities that consider the longer term strategic development goals identified in the West District Grid.

The *Sydney Green Grid West District* project opportunities focus on environmental and recreational performance potential and location in proximity to future development plans, strategic lands, complimentary infrastructure projects or local government priorities. Projects were categorised into two strands for future open space planning, Green Grid projects that protect high value lands (the "protectionist strategy") as long-term planning for future urban development and projects that align with Sydney's current development

priorities (the "projectionist strategy"). The overlap or proximity of Green Grid projects with development growth or priority precincts, strategic lands or open space needs in areas of deficiency or disadvantage. It is from these protectionist projects that the highest priority projects were identified.

The West District Green Grid project opportunity clusters were identified as a starting point to ensure the more generalised district strategies and any future project delivery responds to the local strategic context and landscape conditions.

Priority Penrith Clusters identified in West District Green Grid are:

WD 1.1 PENRITH - ST MARYS

This outer suburban area is characterised by a dominant linear rail line, road infrastructure and the industrial land south of Penrith and north of St Marys. With proposals to undergo significant urban renewal around the station precinct and Panthers site, Penrith will form a critical link between the South-West and North-West Growth Centres and Western Sydney Employment Area. Penrith's catchment however, extends far beyond to areas such as the Blue Mountains, Hawkesbury, Blacktown, Camden and Wollondilly LGAs and as far as Central Western NSW. With significant areas of open space occupying the floodplain there is great opportunity for rejuvenating open spaces, sports facilities and providing new connections that

will support recreation needs and enhance liveability for a growing population in the surrounding area and beyond. With Penrith's close proximity to the Nepean River there is key opportunity to enhance open space, pedestrian links, sports and water sports facilities along the Nepean River and as part of the Penrith Lakes Regional Park and employment lands. There is also opportunity to provide improved pedestrian and cycle connections from the areas of renewal around the stations at Penrith, Kingswood, Werrington and St Marys with the open space network, green corridors of South and Ropes Creek and the Penrith Education and Health Specialised Precinct which includes Nepean Hospital and WSU Penrith Campus.

WD 1.2 NEPEAN RIVER, PENRITH

The Nepean River at Penrith is considered to be the stretch from the M4 bridge to the Penrith Lakes precinct on both the eastern and western banks. With a significant amount of water frontage within the Penrith LGA there are key opportunities to enhance the identity of the area through public domain improvements and improved access to, across and along the river. Connections from surrounding centres to the river can also be enhanced. Key sites that could contribute to the open space network are Penrith Panthers, Penrith Council's Carpenter and Woodriff Gardens, Peach Tree Creek corridor,

Penrith Lakes precinct, Tench Reserve, Weir Reserve, Regatta Park and River Road Reserve.

WD.1.3 HAWKESBURY-NEPEAN RIVER

The River, its floodplain and tributaries are the most distinguishing features of the district. With a tradition of agriculture and rural residential dwellings, the major opportunities for open space projects are to create continuous foreshore access and increased access to the waterfront at key destinations. As increases in density occur within nearby centres, the importance of the river as a recreational destination will also increase. Water quality management and revegetation along all waterways should be sought at every available opportunity.

WD.1.4 PENRITH LAKES

Covering an area similar to that of Sydney's outer harbour, there is significant opportunity for the previous quarry at Penrith Lakes to become Western Sydney's iconic water haven. An urban settlement within an extensive system of lakes and parklands will also become a major recreational asset for Western Sydney. The project provides an opportunity to show case best practice in environmental rehabilitation and water management. It provides opportunities for enhanced quality of life and healthy lifestyle choices for the people of Western Sydney and beyond. The established sports focus

(Sydney International Regatta Centre and the Penrith Whitewater Stadium) will guide the development of the parklands, with the Lakes providing a unique open water body for the people of Western Sydney.

WD.1.5 SOUTH CREEK AND ROPES CREEK

Western Sydney is defined by its network of creeks and rivers systems. Currently many of the creeks suffer from poor water quality due to surrounding land uses and reduced or fragmented vegetation cover. As land use patterns change and development increases, Ropes and South Creek corridors have the potential to be 'green corridors' providing a greater contribution to the development of healthy urban environments, active lifestyles and connectivity. With a balanced approach to access, biodiversity, development and recreation these networks can form valuable green infrastructure supporting future growth in the district.

WD.1.12 GLENMORE PARK

This area is characterised by the existing residential at Glenmore Park and Glenmore Ridge. There is opportunity to improve water quality and vegetation cover of the extensive creek network and utilise these corridors to provide healthy urban environments, active lifestyles and connectivity to support future growth in the area.

Source: Sydney Green Grid Plan 7 West District Tyrell Studios



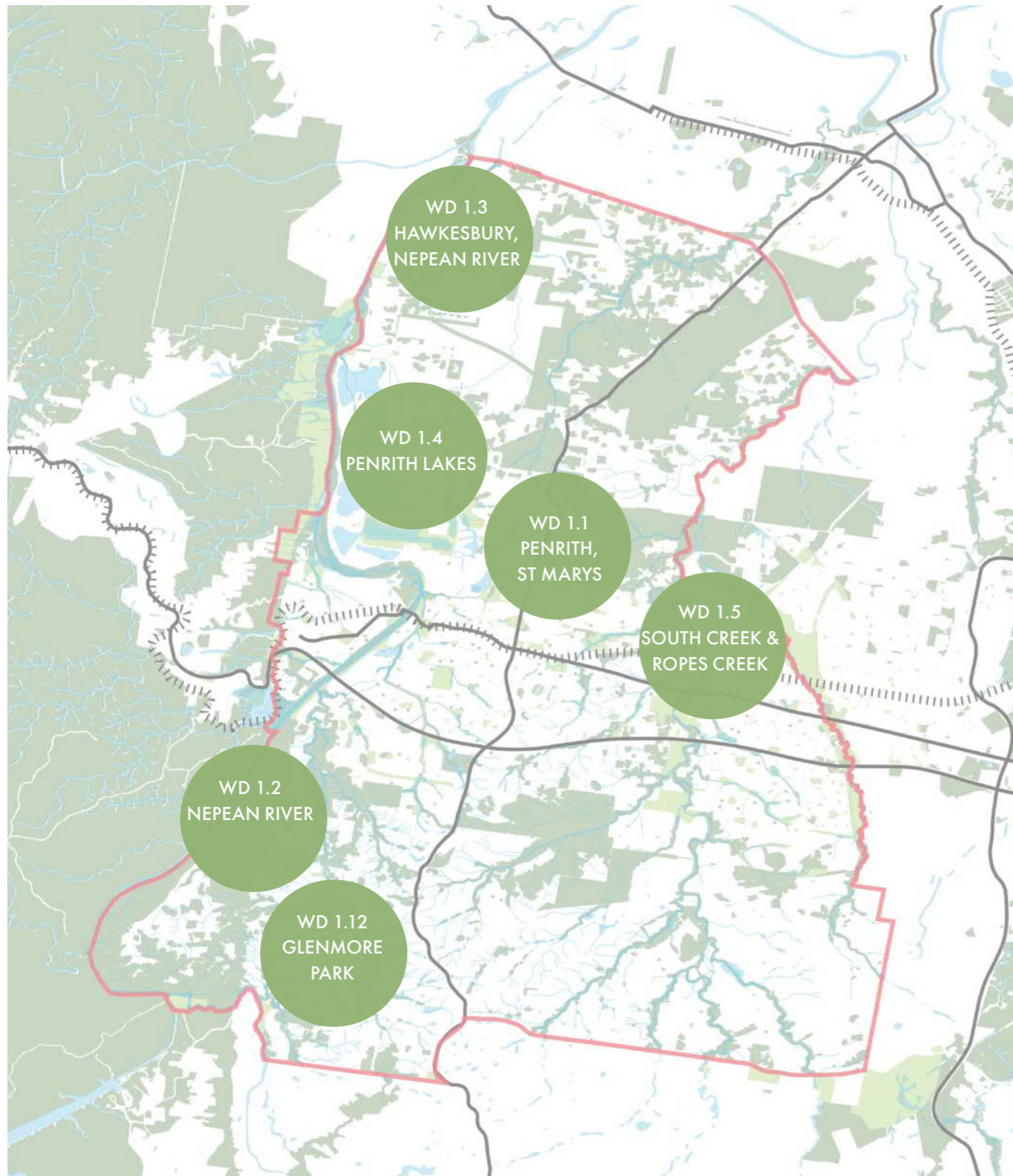


Figure 8. West Grid District Clusters for Penrith LGA

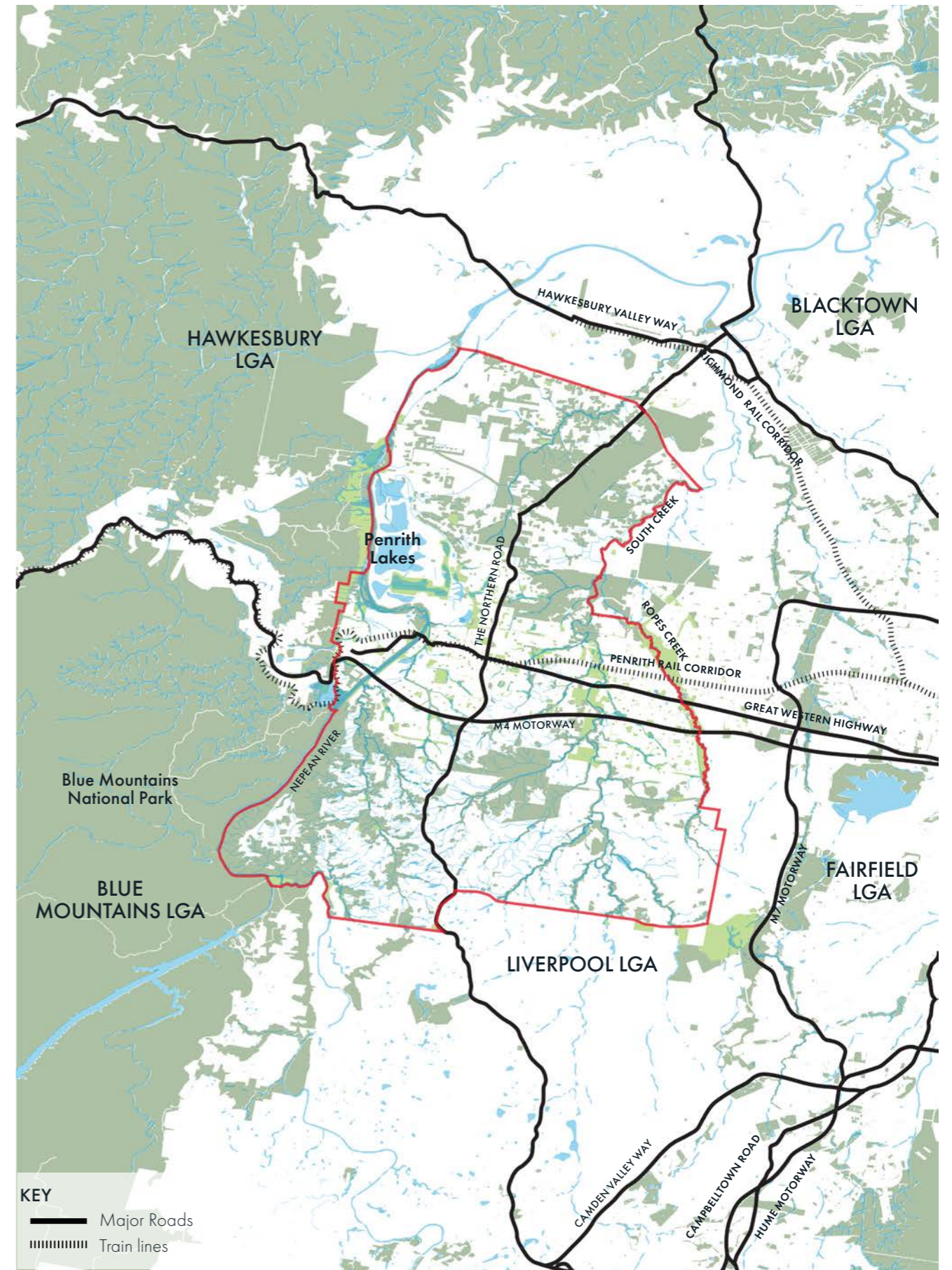


Figure 9. Penrith LGA Infrastructure & Blue/Green Grid Context



5.2 West District Green Grid Project Opportunities

The following table lists West District Green Grid Project opportunities identified for Penrith with longer term strategic development goals.

*The “Dominant Grid Layer” in the Project List refers to the infrastructure layer of the city that is most concerned with this project, and as a result may have funding allocated to it. This layer only represents the project as it currently exists and is not necessarily correlated to its future vision. West District Green Grid Tyrrell Studios 2017.

WEST DISTRICT PROJECT OPPORTUNITIES		GREEN GRID PROJECT TYPE- Dominant Grid Layer	
1	The Great River Walk : The Hawkesbury Nepean River	PRECINCT 1,2,5,6,7,10	Waterway Corridor
2	South Creek	PRECINCT 1,2,3,4	Waterway Corridor
3	Ropes Creek (also West Central District)	PRECINCT 7,8,9,11	Waterway Corridor
4	Penrith Lakes Parklands	PRECINCT 2,5	Former Infrastructure
5	Penrith CBD and Hospital to the River Green Links	PRECINCT 5	Urban Centre Street Links
6	Great Western Highway: Penrith to Parramatta Easements	PRECINCT 4,5,7,8	Transport Corridors
7	Great Western Highway: Penrith to Blackheath Cycle Link	PRECINCT 4,5,6	Transport Corridors
8	Cranebrook to Windsor Downs Nature Reserve Corridor	PRECINCT 1,2	Ecological Lands
9	Nepean Creeks incl. Mulgoa Ck and Surveyors Ck	PRECINCT 5, 10, 12	Waterway Corridor
10	M4 Western Motorway Corridor Open Space	PRECINCT 5, 6,8,10,	Transport Corridors
11	Penrith Rail Line Corridor from Penrith to Blacktown	PRECINCT 2, 4, 5,7,8	Transport Corridors
12	Warragamba Pipeline Open Space Corridor	PRECINCT 11,12	Utilities Easement
13	Rickabys Creek Open Space Corridors	PRECINCT 1,2	Waterway Corridor
14	North West Rail Link Extension: Rouse Hill to St. Marys	PRECINCT 4,	Transport Corridors
15	Sydney Metro (South West Rail Link Extension): St. Marys to Badgerys Creek .	PRECINCT 4,7,11	Transport Corridors
16	M9 Outer Sydney Orbital	PRECINCT 1 4,7,11	Transport Corridors
17	The Northern Road Green Boulevard: Badgerys Creek to Penrith	PRECINCT 3, 5,7,9,10, 11,12	Transport Corridors
18	Shanes Park and Wianamatta Regional Park	PRECINCT 2,3	Ecological Lands
19	Blaxland Creek Bushland Reserve, Blaxland Creek and Crosgroves Creek	PRECINCT 12	Waterway Corridor
20	Agnes Banks Nature Reserve	PRECINCT 1	Ecological Lands
21	Agnes Banks East West Links: The Driftway and Devlin Road	PRECINCT 1	Mixed Open Space Corridor
22	Mulgoa Nature Reserve	PRECINCT 12	Ecological Lands
23	Jamison Park and South Penrith Open Space Corridors	PRECINCT 5	Parkland Corridors
24	Glenmore Park Open Space Corridors	PRECINCT 10	Parkland Corridors
25	M12 Motorway Green Boulevard	PRECINCT 11	Transport Corridors

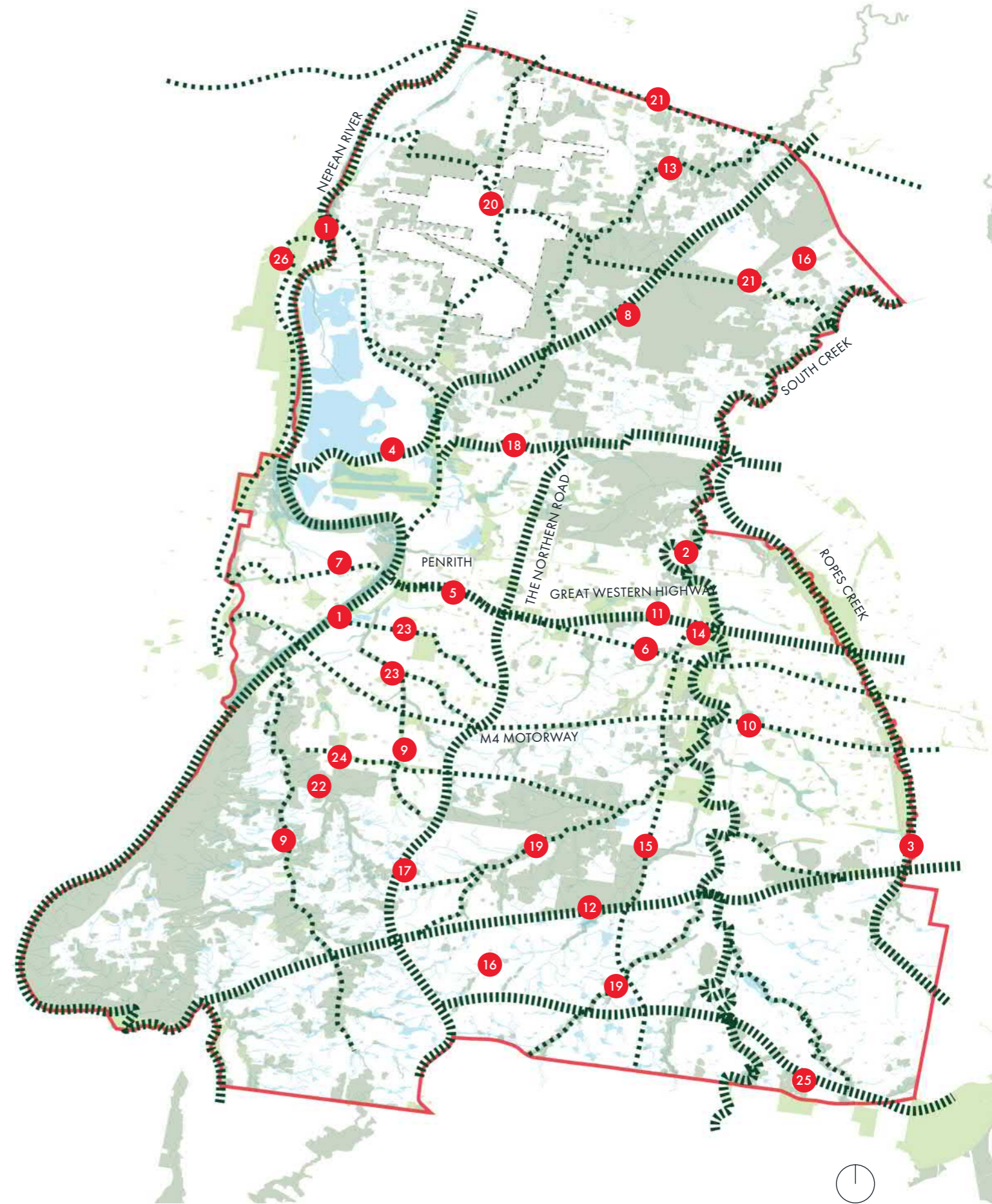


Figure 10. West District Green Grid Project Opportunities

5.3 Precinct Mapping

For the purpose of mapping, the City has been divided into the 'Aggregated Areas' adopted in the Penrith Sport and Recreation Strategy. The Aggregated Areas have been developed based on Profile ID statistics and reflect the demographics, size and varying residential, rural and commercial districts. For The Strategy, Orchard Hills has been shown within one Precinct, Central East, despite geographically being split by the M4 Motorway.

The precincts should be reviewed in the context of their adjoining suburbs as the Green Grid implementation is to ensure the network reinforcement of transport connectivity, ecological, hydrological and open space systems throughout the LGA and beyond.



Figure 11. Penrith Green Grid Precinct Map (Aggregated Areas)

- 1 PRECINCT 1 RURAL NORTH**
Londonderry, Berkshire Park, Llandilo, Agnes Banks, Castlereagh
- 2 PRECINCT 2 CENTRAL NORTH**
Cranebrook, Kingswood Park, Lemongrove, Penrith (North of Railway Line)
- 3 PRECINCT 3 EAST NORTH**
Jordan Springs
- 4 PRECINCT 4 CENTRAL EAST**
Cambridge Park, Cambridge Gardens, Werrington, Werrington County, Werrington Downs, Caddens, Claremont Meadows, Kingswood
- 5 PRECINCT 5 CENTRAL**
Jamisontown, South Penrith, Penrith (South of Railway Line)
- 6 PRECINCT 6 CENTRAL WEST**
Central West, Emu Heights, Emu Plains, Leonay
- 7 PRECINCT 7 EAST 1**
St Marys, North St Marys
- 8 PRECINCT 8 EAST 2**
Colyton, Oxley Park
- 9 PRECINCT 9 EAST 3**
Erskine Park, St Clair
- 10 PRECINCT 10 CENTRAL SOUTH**
Glenmore Park, Regentville
- 11 PRECINCT 11 SOUTH EAST**
Orchard Hills, Luddenham, Kemps Creek, Badgerys Creek, Mount Vernon
- 12 PRECINCT 12 SOUTH WEST**
Mulgoa, Wallacia

5.4 To Understand Penrith, GIS Mapping

The Strategy's methodology has identified location specific linkages in response to character by understanding existing green cover, open space, heat, walkability, pedestrian generators and destination data. Localised mapping has allowed the examination of existing landscape and infrastructure to reflect the different needs in communities across the city.

Making use of the character features in each precinct, along with a range of other goals, the Strategy will ensure Penrith becomes a more equitable and liveable city which evolves with a genuine sense of place woven throughout.

Source of material

Geographic Information System (GIS) data has been utilised in the mapping of the City's Green Grid. A series of baseline data visualisations was prepared for each Precinct, material was sourced as noted below. Data sets were created to provide a visual image of links, opportunities and constraints. The base data was utilised to assist in the determination of Green Grid projects for each precinct as identified in the *Penrith Green Grid Project Matrix*.

See *Appendix B* for data sets which have been used as part of the mapping analysis studies for this work.

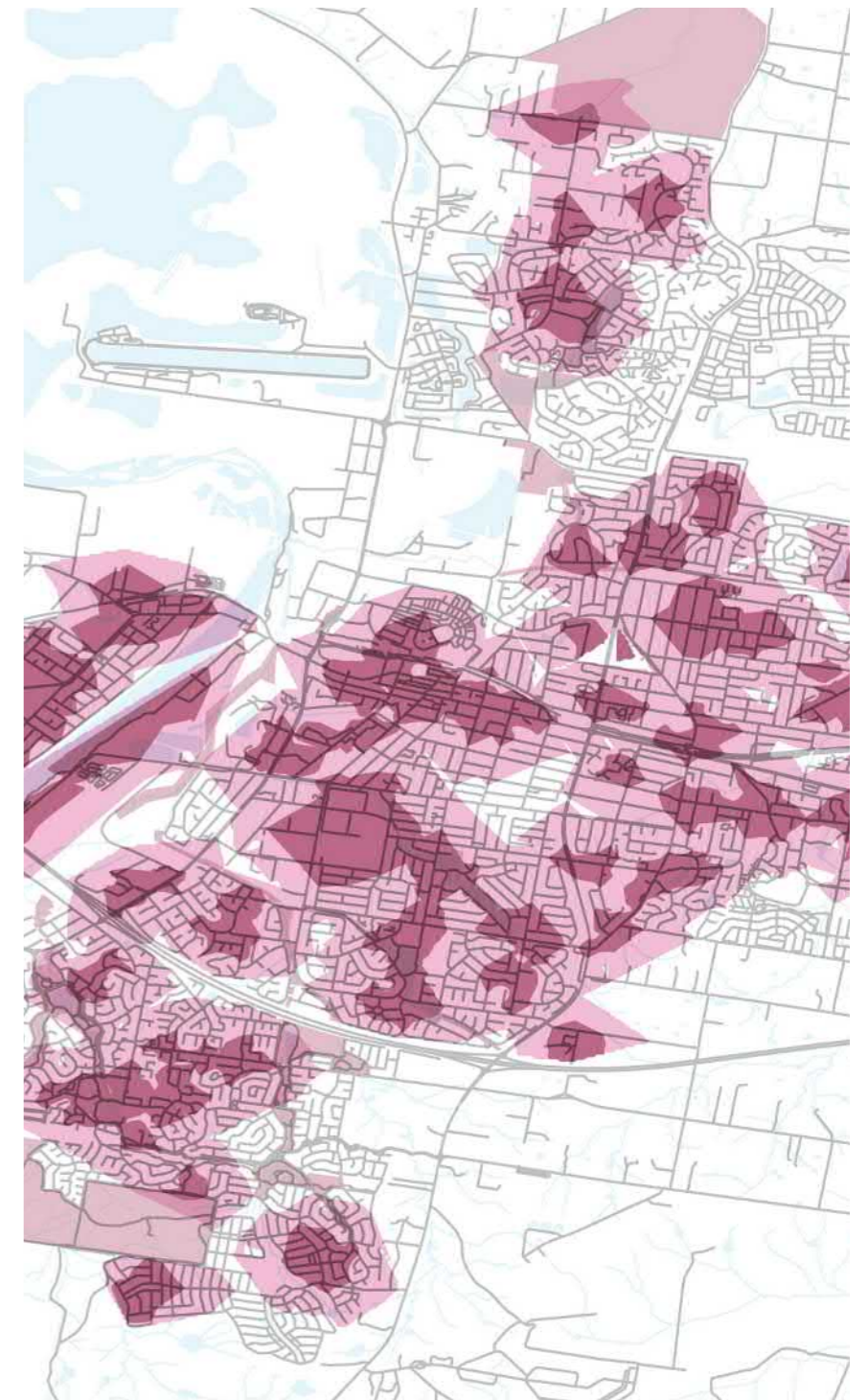


Figure 12. Example of GIS data set - extract of 400m and 800m walking catchments from key destinations

5.5 Baseline Green Grid Mapping

Four data sets were initially prepared to form the basis for the identification of future opportunities and constraints.

Ecological Grid

Ecosystems (forest, grassland and wetland, aquatic and freshwater)

Relationship to Green Grid

Biological hierarchy and organisation to enhance biodiversity to ensure ecological resilience. Opportunity to create green habitat corridors and protecting endangered ecological communities.

Hydrological/Blue Grid

(Including the 100 year flood extent)

Relationship to Green Grid

Water in the landscape linking Green Grid places, spaces and opportunities around the identification of missing links for open space and ecological communities within the Hydrological Grid.

Recreational Grid

(e.g. parks, gardens, squares, plazas, public and private courtyard and forecourt, sports and playing fields, riparian corridor passive recreation).

Relationship to Green Grid

Green Grid places and spaces that form the network destinations for the community with opportunities to reinforce and improve the Recreational Grid.

Connectivity and Access Grid

Street and laneway network, cycleway network, infrastructure easements, key activity nodes such as town centres, street tree planting, topography, transport nodes and network, and the connections between recreational, hydrological and ecological grids

Relationship to Green Grid

The network connections to Green Grid places and spaces.

The baseline grids overlap and intertwine as the network system has multi functions associated with both natural systems (rain and flooding) and provision of public and cultural outcomes (social interaction and health). These plans start to show opportunities for the grid network at the broader scale.

Additional GIS Layers

Heritage and tree canopy data were identified as being additional key inputs and this data is shared on the following pages.

Further supplementary data was mapped to inform the detailed evaluation of each precinct and to assist in the preparation of the Priority Project values. Additional data sets mapped include: Connectivity, Contours, Elevation, Slope, Population Density, Population Forecasts, Socio-Economic Indexes for Areas Disadvantage, Tree Cover, Urban Heat, Walking Catchment from key destinations at 400 and 800 metres.

This data adds topographic, landscape character and human overlay to the baseline grids.

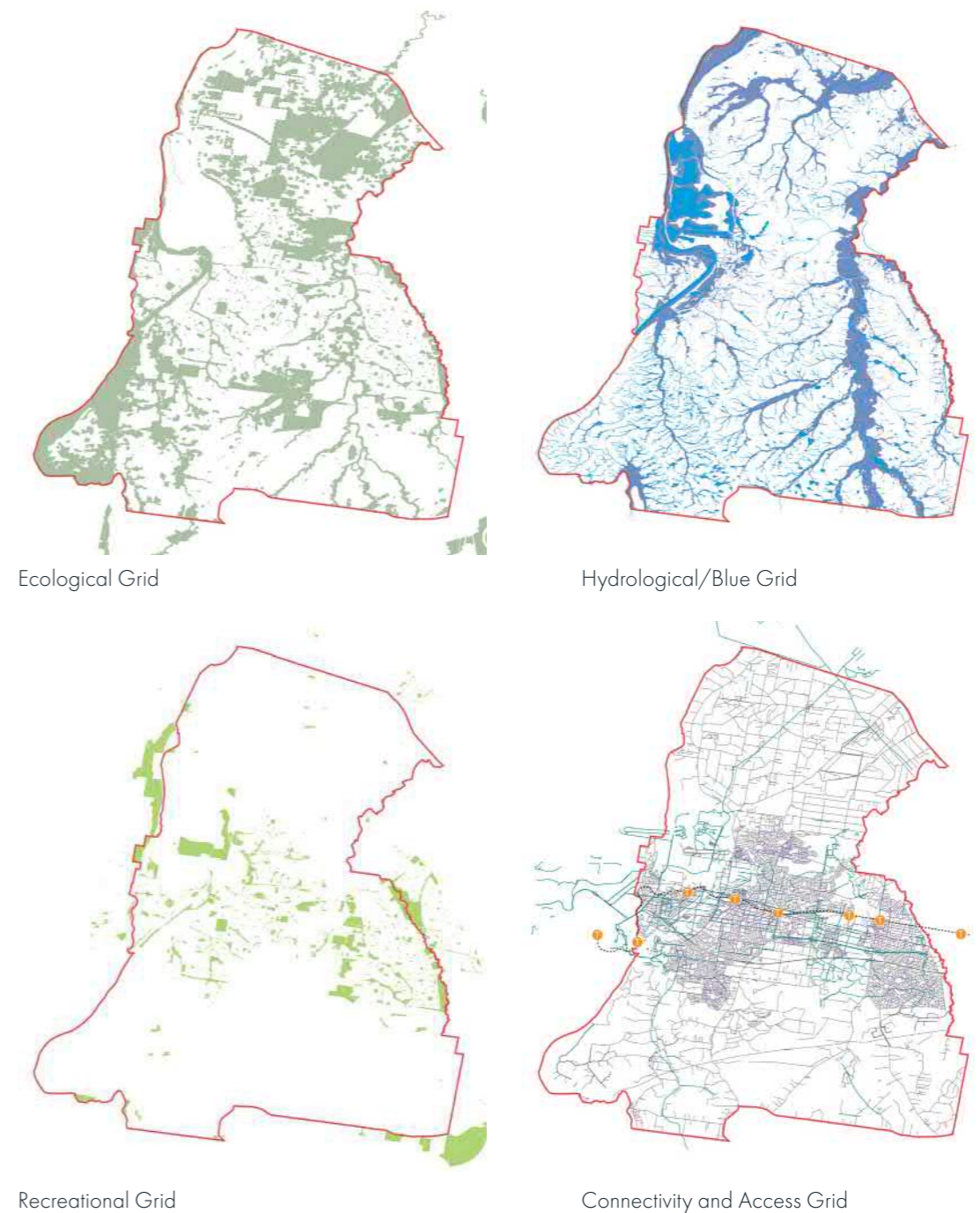


Figure 13. LGA Layers

Heritage Layer

Heritage items as identified in *Penrith Local Environmental Plan 2010*.

Relationship to Green Grid

Use this information at a project level to ensure Green Grid projects are complimentary to heritage values which can be factored into the proposals. It is acknowledged that there may be sites of Aboriginal significance and culturally valued which may not be mapped here. Counsel to be sought from the appropriate knowledge holders to confirm this aspect as part of connection to Country and early project conversations.

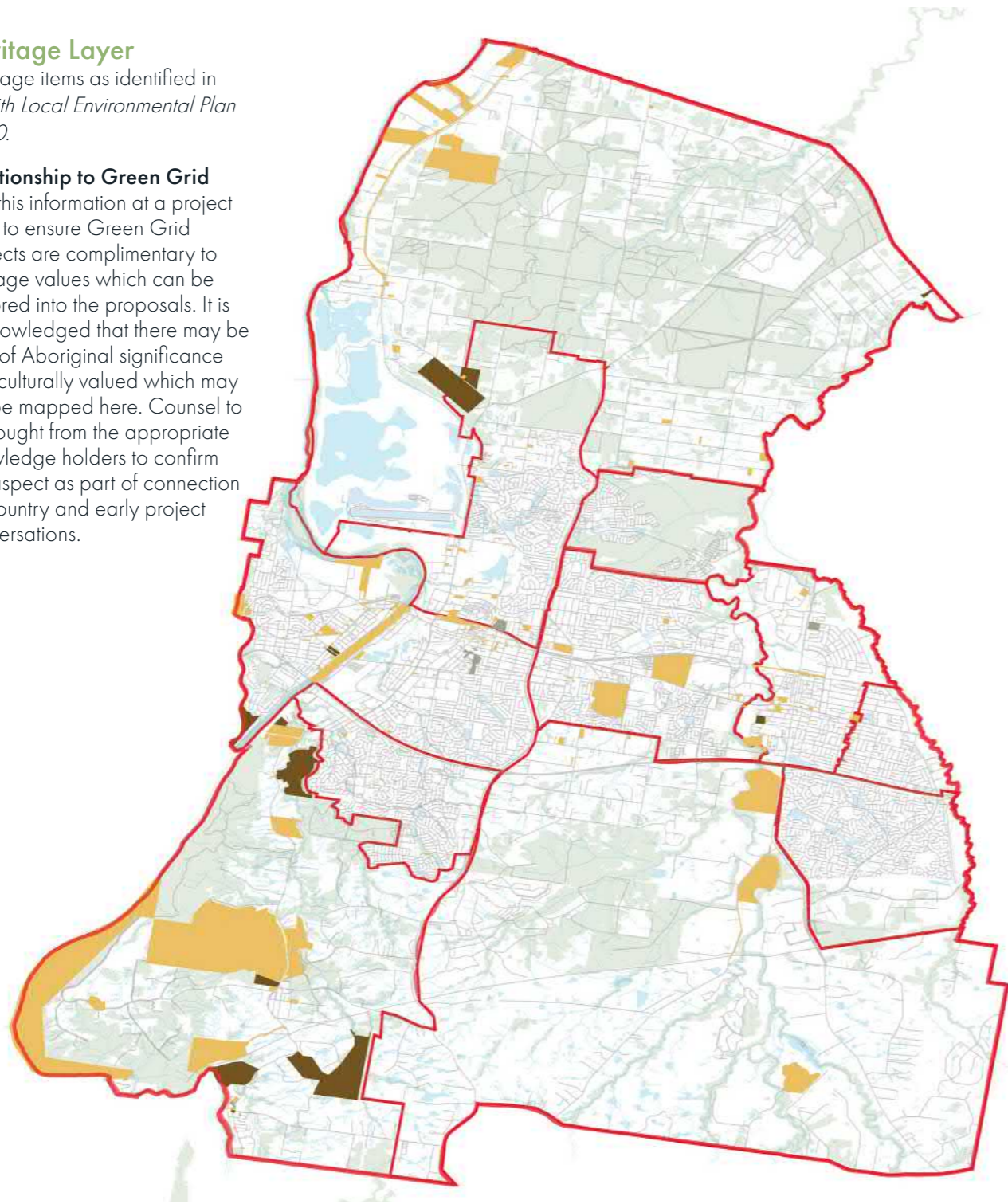


Figure 14. LEP Heritage data

KEY

- Heritage - General
- Heritage - Archaeological
- Heritage - Conservation

Tree Canopy

Existing tree cover (Geoscape Surface Cover - mapped tree canopy layer).

Relationship to Green Grid

Geoscape data for urban precincts (Precincts 2 -11). Use this as a foundation for understanding existing tree canopy coverage and assessing where most significant gaps in tree coverage are. See section 7.8 for further information on data and canopy coverage.

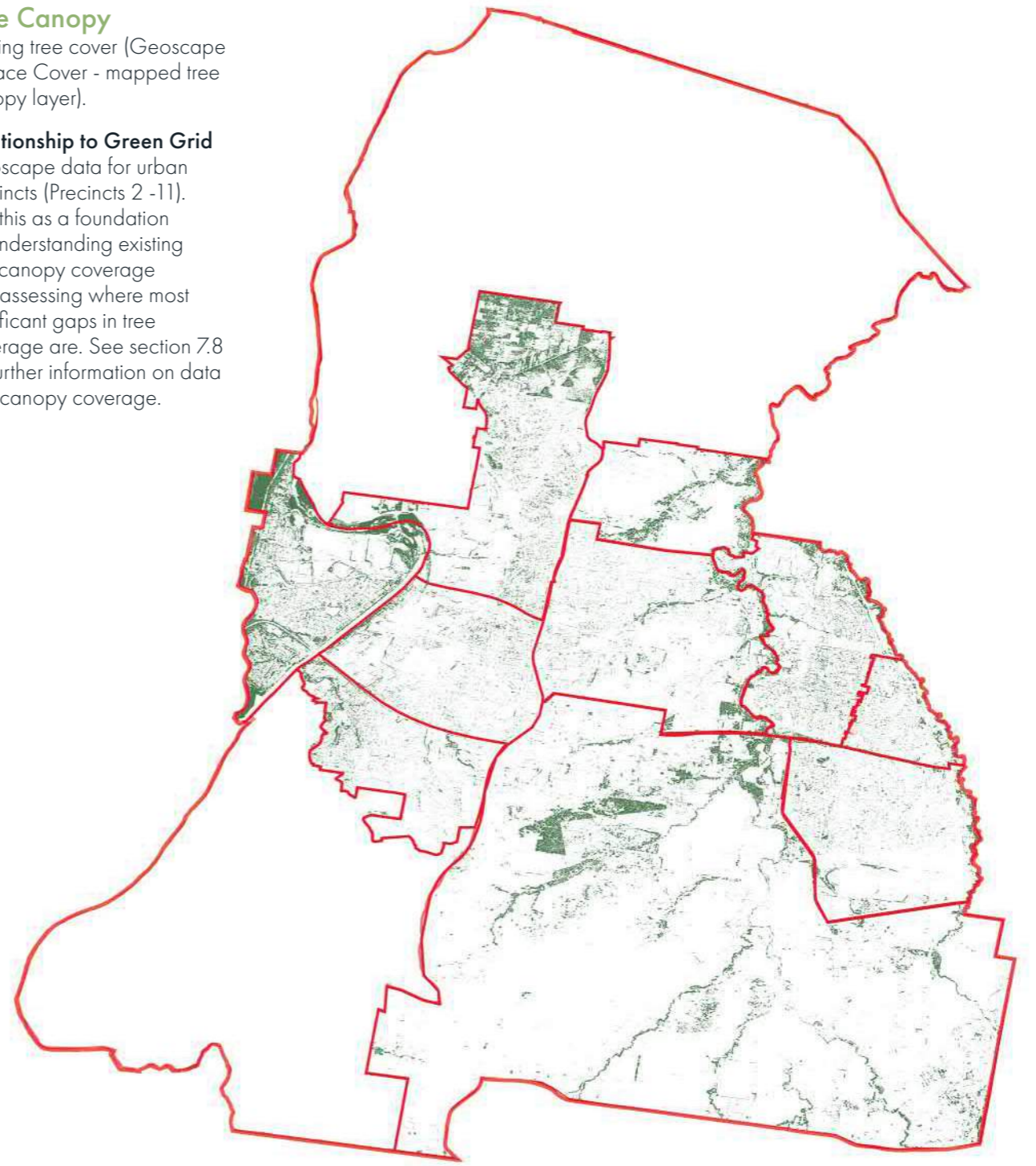


Figure 15. Tree canopy coverage

KEY

- Existing Tree Canopy



Understanding character of each precinct layered with this analysis work ensures The Strategy will respond to a genuine sense of place for the benefit of each area.

GREEN GRID MATRIX, MAPS & PRIORITY PROJECTS

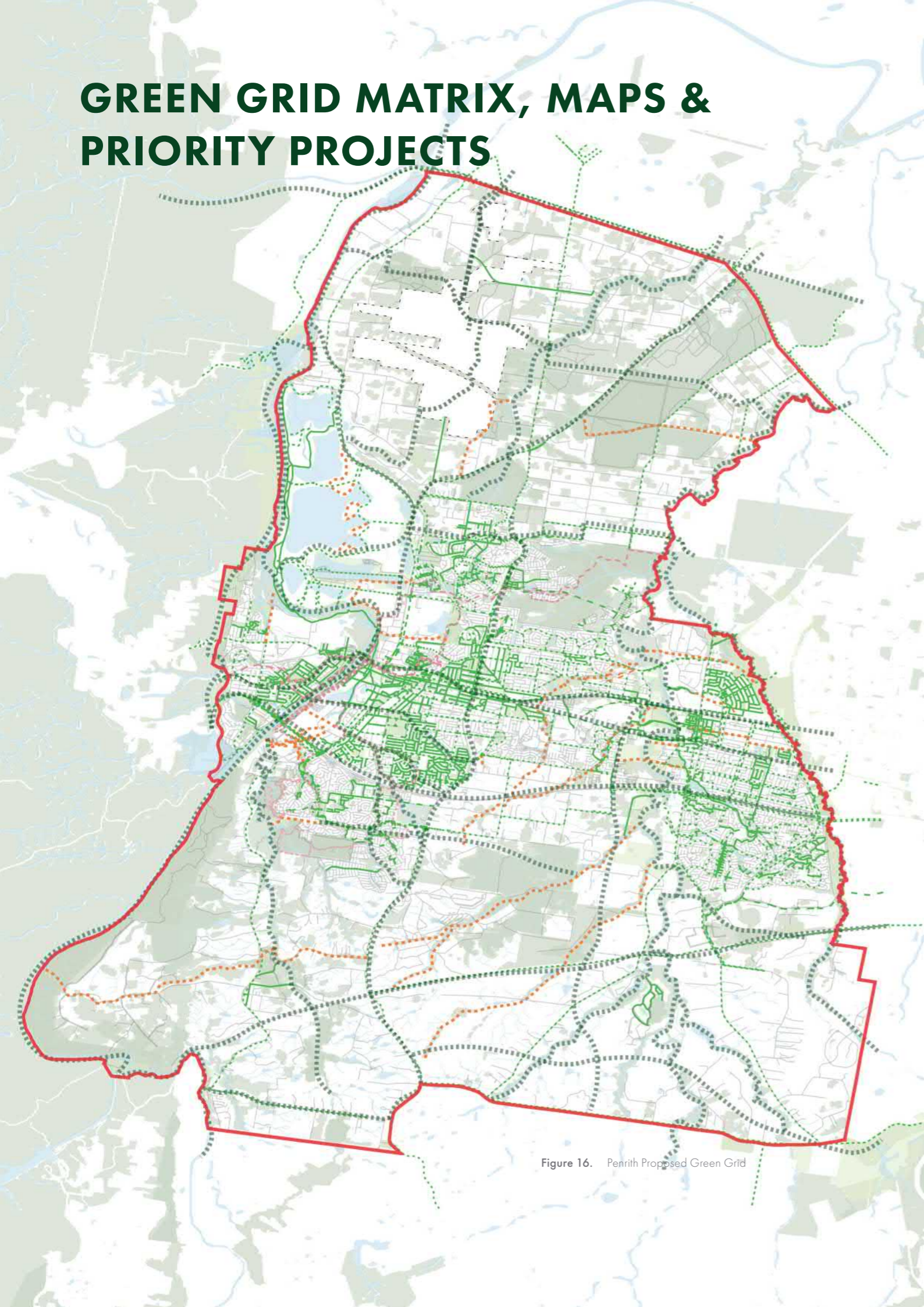


Figure 16. Penrith Proposed Green Grid

6 GREEN GRID MATRIX, MAPS & PRIORITY PROJECTS

6.1 Penrith Green Grid Matrix & Priority Project Values

Penrith Green Grid Project Values

The Matrix identifies Penrith Green Grid projects by assessing eight values for each. Priority projects are selected based on their score, complexity, relevance and overall benefits.

Emphasis has been placed on connectivity projects located within high population and high urban temperature zones that fulfil linking criteria as active transport, open space and hydrological connections.

Precedence has been placed on the creation of contiguous corridors of public open space and urban tree canopy that will mitigate urban heat and manage flows of stormwater to create liveable and sustainable communities. By creating contiguous corridors of green and open space, the green grid will also contribute to the delivery of ecological benefits.

Each project received a total score based on the following Penrith Green Grid Project values:

- Recreational space and connections
- Riparian/Ecological corridor
- Train/Metro Station connection
- Active Transport route
- Education/Health Precinct Connection
- Local Centre Greening or Connection
- Existing Population and/or Future Growth Area
- Urban Heat mitigation

The project values are a synthesis of criteria which are important in establishing the Penrith Green Grid and recognise the changing nature of the LGA and the impact and opportunities that a growing population will provide.

The category rating score ranged from 0-2 for each value. The higher score of 2 was allocated to recreational, transport and active transport links as the Green Grid is primarily to connect open space networks to the population.

Development of Priority Projects List

The *West District Green Grid (WDGG)* priority project list and cluster identification has been considered in the development of the Strategy. Waterways, green space, cycle routes and potential cross linkages in the north-south and east-west directions linking to WDGG projects have been identified.

Major infrastructure corridors such as Sydney Metro, the Warragamba pipeline and M12 Motorway are not within areas of existing population density and have not scored as highly as links to existing transport nodes, neighbourhoods and recreational spaces. However, these projects do offer an opportunity to contribute to the Green Grid and are an important part of the broader network. Projects that encourage and improve walking and cycling connections, reduce urban temperatures and are located in population concentrations have scored more highly as they provide direct benefit to the most people

Priority projects were selected based on relevance to the WDGG and local development priorities. Potential projects that are located within the vicinity of one another have been clustered in order to deliver broader neighbourhood benefits.

Penrith Green Grid Plan Project Values										
Suburb	Street Name	Category rating	Recreational space and connections (0-2)	Riparian / Ecological corridor (0-1)	Train / Metro Station connection (0-2)	Active Transport Route, existing or proposed (0-2)	Education/ Health Precinct Connection (0-1)	Local Centre Greening or Connection (0-1)	Existing Population and/or Future Growth Area (0-1)	Urban Heat Effect Mitigation (0-1)

Figure 17. Penrith Green Grid Plan Project Values

6.2 Applying the Matrix

Matrix Colour Coding

A colour coding has been applied to the assessment matrix to assist with visual understanding of the outcomes.

West District Green Grid and Penrith Sport and Recreation Strategy projects were identified and have been highlighted green.

The Great West Walk projects have been highlighted in pink.

Priority and Catalyst Projects which are high scoring have been highlighted with blue in the total value column.

Priority Future Connections have been identified in orange and have been identified to complete key links but are longer term

Priority Projects

The matrix provides an understanding of each precinct and prioritises needs. Multi-dimensional outcomes have been prioritised with consideration from local to regional scales, level of connectivity and localised benefits.

Some Priority Projects have scored highly but have not been selected for short term implementation based on ownership, deliverability associated with scale of change, contamination, infrastructure issues, costs etc. Some projects are currently being progressed separately by State Government or by Council.

Ultimately all projects should be undertaken and the scoring assists Council in the identification of priorities as well as potential project clusters which will provide greater local amenity.

Monitoring the Strategy

The Strategy is the combination of different scales and different types of interventions, starting at the regional scale to ensure connectivity to local urban surroundings.

The Matrix and Precinct Maps should be utilised as dynamic documents that can be used to measure and monitor the success of the grid implementation and should be refined and adjusted to capture development opportunities as they arise.

6.3 Precinct Maps

The base layers to each Precinct Map includes the following:

- Train lines, motorways, highways, roads and streets
- Recreation, open space and ecological lands (NPWS)
- Rivers, lakes and watercourses

The *West District Green Grid* (WDGGP) projects have been mapped in conjunction with the proposed *Precinct Grid* which identifies:

- Existing Shared Paths
- Existing On Road Cycleway

- Proposed Active Transport
- Local Green Grid
- Priority Future Connections

Cycling and walking routes should be prioritised for greening as they link to key destinations, transport and open space networks.

Mapping Walking Catchments – Local Green Grid

The matrix identifies destinations such as education and health facilities, neighbourhood centres, parks and open space corridors. The *Local Green Grid* is based on the walking catchments of 800 metres point to point (10 minutes walking distance) of each of these destinations. All connections within the walking catchments of these destinations have not been shown as it would have resulted in entire precincts of the LGA being identified as local green grid, making prioritisation and implementation difficult.

For clarity, pedestrian and cycling connections linking destinations are mapped and should be the initial connections for implementation with the aim of implementing the full grid in accordance with the *Walking Catchment* map for each Precinct.

Priority Future Connections

Priority future connections are potential linkages that are not on Council owned land, along hydrological corridors or are of a significant scale that if implemented will provide broader north-south or east-west connectivity to West District Green Grid connections. These projects have been identified as *Priority Future Connections* as they require consideration in short term planning decisions to achieve the desired connectivity of the Grid.

6.4 Precinct Data

The following section provides a detailed summary for each precinct:

Precinct description and grid project summary

Each precinct includes text that summarises future population expectations, urban temperature affected suburbs and a general description of important attributes that have influenced the development of the Precinct Strategy.

WDGG Clusters and individual corridors are listed with specific Penrith Green Grid linkages that require precinct planning.

Precinct Short Term Actions and Priority Projects have been listed from the Matrix. These projects scored a higher total value based on Penrith Green Grid project values and should be actioned within the next twenty years.

Priority Future Connections are key missing connections that should be planned for in the short term to ensure grid connectivity.

Background Data Sets

Each precinct includes the broader GIS maps covering specific data sets that have been utilised in developing the grid. Particular data sets have been combined to provide a clearer picture for each precinct. The following individual maps informed the grid development.

West District - Green Grid project opportunities

Strategic Green Grid opportunities identified in the (WDGG) integrating open space with existing and future transport and development projects.

Hydrological Grid –watercourses and creeks

Riparian areas to be enhanced and protected to improve flooding and drainage, natural character, ecological integrity, and visual amenity.

Recreation – open space, (passive and active) and Ecological – National Parks and conservation areas

Existing open and recreational space including areas to create corridors of biodiversity and areas of high conservation value

Active Transport, footpaths and cycle ways (existing and proposed)

Primary pedestrian linking pathways in conjunction with bike path networks, on road, separated and shared.

Urban Heat

Heat sensor data mapping of urban heat. Sourced from *Benchmarking Summer Heat Across Penrith*. See Section 2.4 for source information and Figure 4 for Maximum air temperature in the suburbs of Penrith (between 14 December 2019 and 29 February 2020) data

Walking catchments at 400 and 800m (10mins)

Pedestrian catchments based on actual walking distance to key destinations

Priority Projects and Scoping

A number of Priority and Potential Catalyst Projects have been selected for detailed development and scoping. Plan and artist impression have been included at Appendix A.

The projects identified are shared as concept proposals to provide an idea of the opportunities offered in each situation.

As each project proceeds this will be developed following Council procedures and guidelines.

Individual projects will require further design development and consideration of local site constraints prior to implementation such as any ground contamination, presence of overhead powerlines, environmental factors, heritage aspects and safety considerations

PRECINCT 1 RURAL NORTH

Londonderry, Berkshire Park, Llandilo, Agnes Banks, Castlereagh



Anticipated Change:

Generally low
Medium level of change for Penrith Lakes site as the Nepean Business Park is developed and the site transitions from quarrying.

Urban Temperature:

Suburbs recorded with high mean temperature during summer that should be targeted for reduction in urban heat island through greening. Castlereagh, Berkshire Park Agnes Banks.

Precinct Background:

Adjoining the North West Growth Area, it is anticipated the Rural North Precinct will have high levels of visitation from new suburbs in the Blacktown LGA. A future Castlereagh connection goes through this precinct for which a corridor has been consulted on but not yet finalised by the NSW Government. The Penrith Lakes site forms the south western section of this precinct. Penrith Lakes Development Corporation and NSW Government are working to determine the future of this site due to flooding risk posed to future development.

A significant portion of this precinct contains environmental reserves that are not under Council control e.g. Castlereagh and Agnes Banks Nature Reserve but are identified as Green Grid linkage opportunities, east-west from the Nepean River to South Creek and north-south to Penrith Lakes.

This precinct includes areas that were deferred from the Penrith Local Environmental Plan 2010. Our LSPS identifies this area as an opportunity area with Deerubbin Local Aboriginal Land Council being a key partner. Opportunity areas are noted as presenting a significant contribution towards our economic, social, tourism, recreation, education and environmental opportunities to benefit our community

West District Green Grid Identified in West District Opportunity Clusters: *Refer Fig 8.

- **WD.1.3 Hawkesbury-Nepean River**
- **WD.1.4 Penrith Lakes**
- **WD.1.5 South Creek and Ropes Creek ***
- Mixed Open Space Corridor - Agnes Banks East West Links: The Driftway and Devlin Road
- Ecological Lands include Agnes Banks Nature Reserve and Cranebrook to Windsor Downs Nature Reserve Corridor.

- Waterway Corridors include The Great River Walk: The Hawkesbury Nepean River, Rickabys Creek Open Space Corridors and South Creek

Penrith Green Grid Links and Actions:

- *Penrith Lakes Regional Park*, Whitewater Stadium, Sydney International Regatta Centre connections are identified as WDGG and PSRS priorities.
- Advocating for the development of *Penrith Lakes* as a Regional Parkland and its linkage to the *Great River Walk* and *Great West Walk*.
- *Hawkesbury-Nepean River*, including active transport connections and role within the catchment of schools and neighbourhood centres. River management to include water quality and revegetation plans.
- Strengthen the Cranebrook to *Windsor Downs Nature Reserve Corridor*
- Reinforce *South Creek* and *Rickabys Creek Waterway Corridor*

Short Term Actions and Priority Projects:

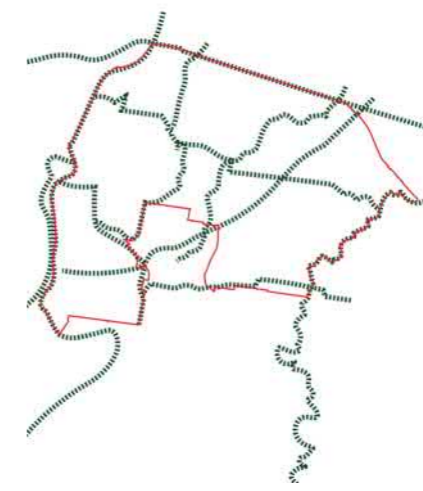
1.3 Penrith Lakes Regional Park, Whitewater Stadium, Sydney International Regatta Centre connections (WDGGP) (PSRS)

1.7 South Creek (WDGGP)

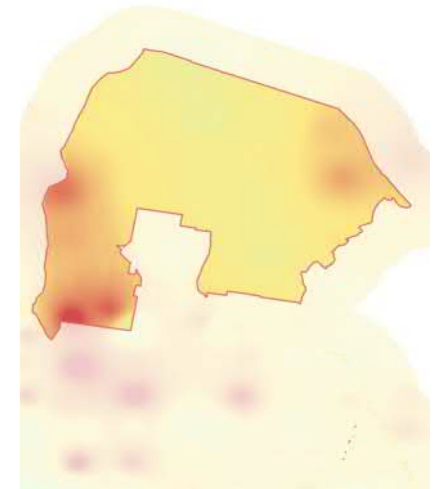
1.9 Londonderry Park and Neighbourhood Centre, Londonderry Post Office, Shops, Londonderry Public School (walking catchment)

Priority Future Connections:

1.5 Castlereagh Nature Reserve, Priority Future East West Connection, connecting The Northern Road (WDGGP) to South Creek (WDGGP)



West District Green Grid



Mean Summer Air Temperature



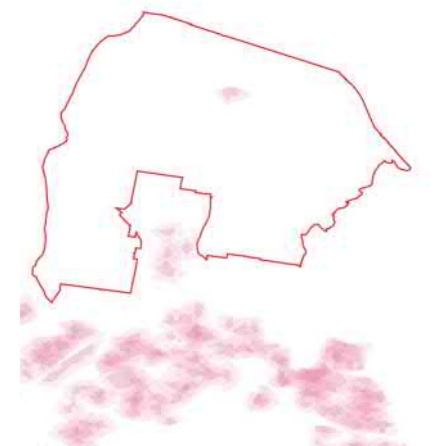
Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 18. Precinct 1 Key Layers

Precinct 1 Matrix & Plan

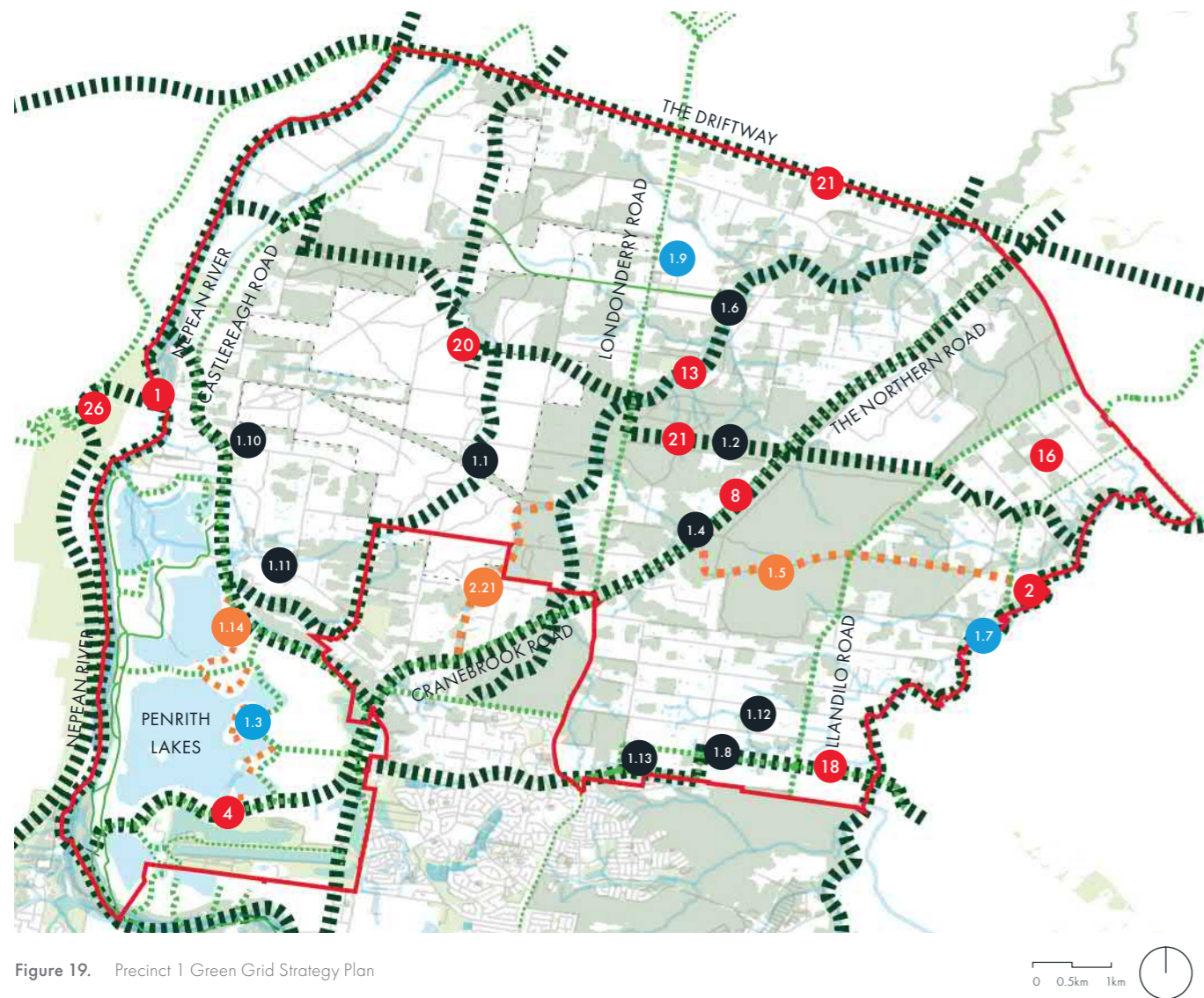


Figure 19. Precinct 1 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 1 The Great River Walk : The Hawkesbury Nepean River
- 2 South Creek
- 4 Penrith Lakes Parklands
- 8 Cranebrook to Windsor Downs Nature Reserve Corridor
- 13 Rickabys Creek Open Space Corridors
- 16 M9 Outer Sydney Orbital corridor (alignment to be confirmed)
- 18 Shanes Park and Wianamatta Regional Park
- 20 Agnes Banks Nature Reserve
- 21 Agnes Banks East West Links: The Driftway and Devlin Road
- 26 Eastern Escarpment Open Space Trails



KEY

- West District Green Grid
- 1.3 Priority Green Grid Project
- 1.8 Green Grid Project
- Recreation & Open Space
- Ecological land
- Deferred Areas - LEP 2010
- Waterways
- Waterbodies

Grid Connections:

- Existing Shared Path
- Existing On Road Cycleway
- Proposed Active Transport
- Local Green Grid
- 1.5 Priority Future Connections

Note: Refer to matrix on following page for project scoring.

PRECINCT 1 - RURAL NORTH

LONDONDERRY, BERKSHIRE PARK, LLANDILO, AGNES BANKS,CASTLEREAGH

			Penrith Green Grid Plan Project Values							
			Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth Area	Urban Heat Effect Mitigation
PROJECT NAME	Suburb	Street Name	Category rating (0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)
			West District Green Grid Project	PSRS Project	Total Value					
1.1	Agnes Banks Nature Reserve NPWS	Castlereagh	Rickards Road	2	1					1
1.2	Agnes Banks East West Links: The Driftway and Devlin Road connecting to Nepean River	Castlereagh	Devlin Road , The Driftway	4	2	1				1
1.3	Penrith Lakes Regional Park, Whitewater Stadium, Sydney International Regatta Centre connections	Castlereagh	Old Castlereagh Road	8	2	1	2	1	1	1
1.4	Cranebrook to Windsor Downs Nature Reserve Corridor, Wianamatta Nature Reserve , Castlereagh Nature Reserve , Windsor Downs Nature Reserve, Hawkesbury Council LGA , NPWS	Berkshire Park		4	2	1				1
1.5	Castlereagh Nature Reserve , Priority Future East West Connection, connecting The Northern Road to South Creek	Berkshire Park	The Northern Road	4	2		2			
1.6	Rickabys Creek Waterway Corridor	Londonderry		4	2	1				1
1.7	South Creek	Llandilo		6	2	1	2			1
1.8	Biodiversity Corridor	Llandilo	Ninth Avenue	4	2	1				1
1.9	Londonderry Park and Neighborhood Centre,Londonderry Post Office, Shops , Londonderry Public School (walking catchment)	Londonderry	Carrington Road, Londonderry Road	6	2			1	1	1
1.10	Castlereagh Public School	Castlereagh	Hinxman Road	2				1		1
1.11	The Lakes Christian College	Castlereagh	E Wilchard Road	2				1		1
1.12	Llandilo Public School	Llandilo	Seventh Avenue	2				1		1
1.13	Xavier College	Llandilo	Ninth Avenue	2				1		1
1.14	Penrith Lakes Foreshore Priority Future connection	Penrith		5	2	1	1			1

Figure 20. Precinct 1 Green Grid Strategy Matrix

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

PRECINCT 2 CENTRAL NORTH

Cranebrook, Kingswood Park, Lemongrove, Penrith (North of Railway Line)



Anticipated Change:

Medium level of change for Penrith north of the railway line as the Thornton development is finalised and the Multi User Depot site is brought to market. Low level of change in existing established suburbs.

Urban Temperature:

Suburbs recorded with high mean temperature during summer that should be targeted for reduction in urban heat island through greening: Cranebrook, Penrith.

Precinct Background:

Established largely residential area with predominately medium-density housing and some low-density semi-rural housing towards the north. Adjoins Penrith CBD to the south where there is expected to be high density population growth. The development in the CBD has potential to span both the Central and Central North precincts.

Open space varies from passive parklands with natural areas, creeks, wetlands to outdoor sports fields.

This precinct includes areas that were deferred from the Penrith Local Environmental Plan 2010. Our LSPS identifies this area as an opportunity area with Deerubbin Local Aboriginal Land Council being a key partner. Opportunity areas are noted as presenting a significant contribution towards our economic, social, tourism, recreation, education and environmental opportunities to benefit our community

West District Green Grid Identified in West District Opportunity Clusters:

*Refer Fig 8.

- **WD1.2 Nepean River, Penrith**
- **WD.1.4 Penrith Lakes**
- **WD.1.5 South Creek and Ropes Creek***
- Waterway corridors include *The Great River Walk: The Hawkesbury Nepean River*, the north south hydrological *Rickabys Creek Open Space Corridors* and *South Creek*. To the west, *Penrith Lakes Regional Park*, *Whitewater Stadium*, *Sydney International Regatta Centre* and *The Great River Walk*: connections are identified as West Grid and Penrith Sport and Recreation Strategy priorities.

- Ecological Lands include *Cranebrook to Windsor Downs Nature Reserve Corridor (NPWS)*, *Castlereagh Nature Reserve (NPWS)*, *Wianamatta Regional Park (NPWS)* and *Shanes Park* which are important regional grid projects connecting to the Hawkesbury LGA.

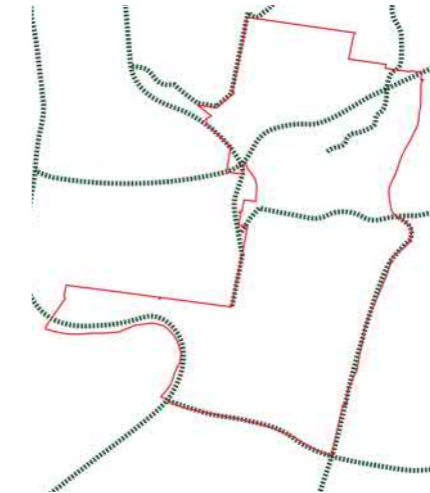
- Transport Corridor - *Penrith Rail Line Corridor from Penrith to Blacktown*

Penrith Green Grid Links and Actions:

- Reinforce pedestrian links to *Penrith Train Station*, *Nepean River* and *Penrith Lakes Parklands*.
- Masterplan *Agnes Banks Nature Reserve* and *Agnes Banks east west connections*.
- Advocate for connections to the existing *Great River Walk* and extensions to it.
- Continue to implement the 'Our River Masterplan'.
- Reinforce *Great West Walk* route
- Co-ordinate active transport routes with Green Grid implementation.
- Implement Green Grid to neighbourhood centres, education precincts and linking to sport, recreation and play areas.



Existing Tree Canopy



West District Green Grid



Mean Summer Air Temperature

Short Term Actions and Priority Projects:

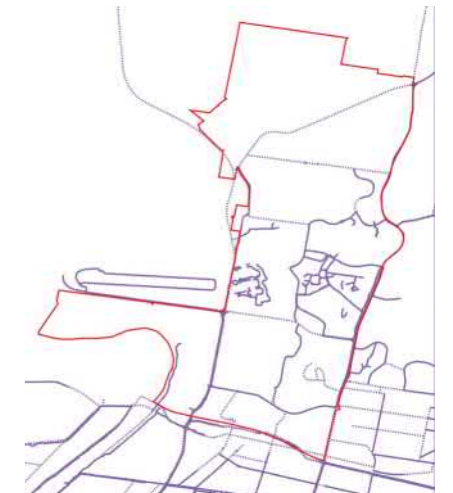
2.4 Andrews Road, planting along corridor from Northern Road to Castlereagh Road, cycle route to Penrith Lakes Parkland High Priority Wetland sites, including OI Glass Factory Ephemeral Wetland. East West Link (WDGGP)

2.10 Great West Walk linking Jordan Springs to Penrith Lakes. Priority project to green corridor.

2.18 Electrical Easement opportunity (east west connection) east west connection, active transport link and planting.



Ecology & Open Space



Active Transport Network

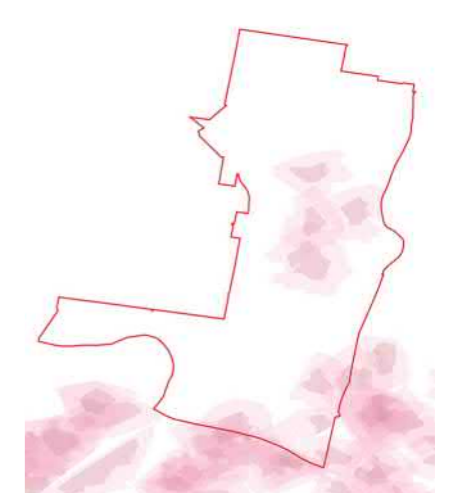
Priority Future Connections:

2.21 Rickabys Creek Open Space Corridor (west) Priority Future North South Connection

2.22 Boundary Creek Priority Future East West Connection linking to Penrith Lakes



Hydrology & Flooding



Walking Catchment 400-800m

Figure 21. Precinct 2 Key Layers

Precinct 2 Matrix & Plan

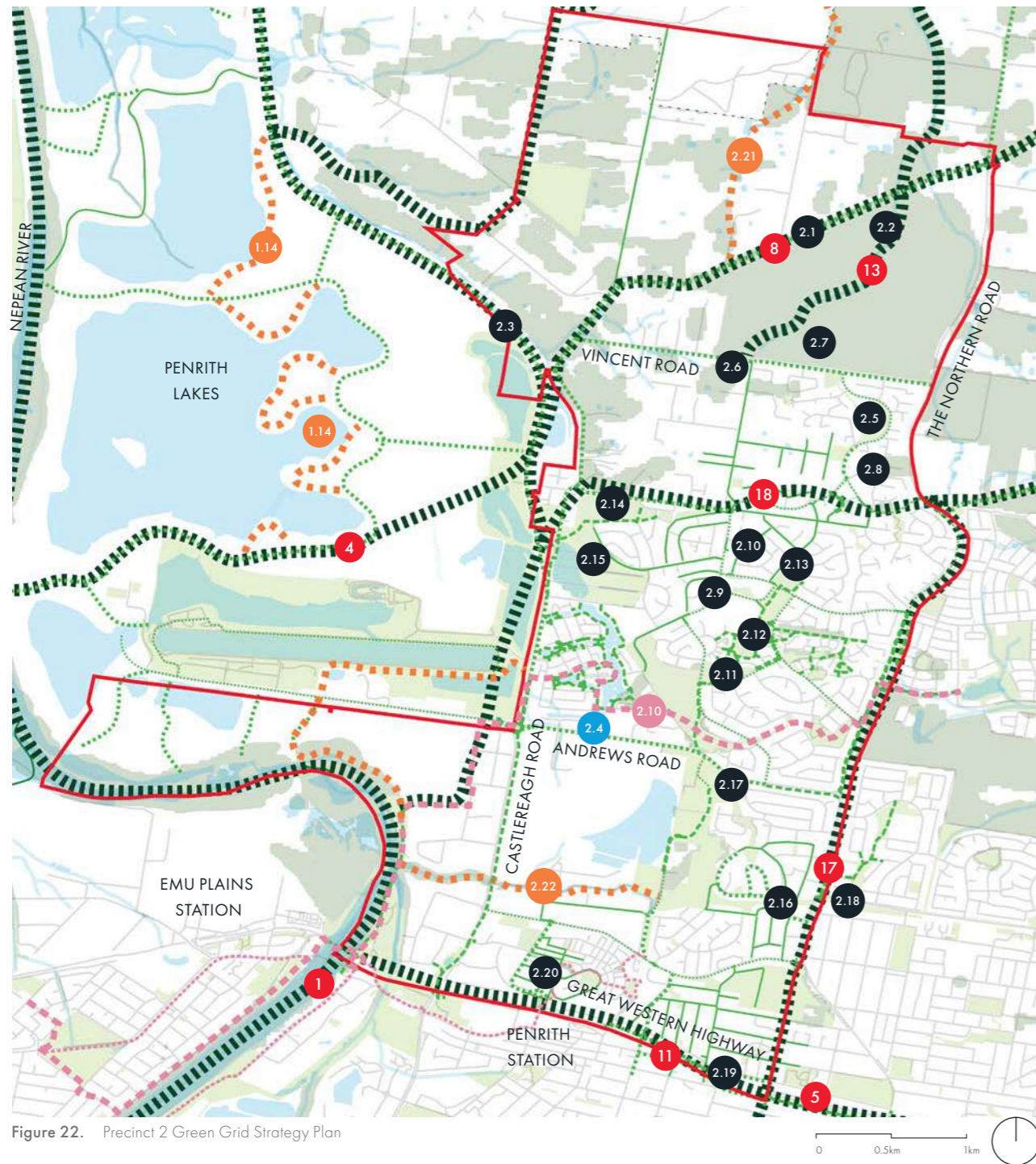


Figure 22. Precinct 2 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 1 The Great River Walk : The Hawkesbury Nepean River
- 4 Penrith Lakes Parklands
- 5 Penrith CBD and Hospital to the River Green Links
- 8 Cranebrook to Windsor Downs Nature Reserve Corridor
- 11 Penrith Rail Line Corridor from Penrith to Blacktown
- 13 Rickabys Creek Open Space Corridors
- 17 The Northern Road Green Boulevard: Badgerys Creek to Penrith
- 18 Shanes Park and Wianamatta Regional Park

KFY

- West District Green Grid
 - 2.4 Priority Green Grid Project
 - 2.1 Green Grid Project
 - Recreation & Open Space
 - Ecological land
 - Deferred Areas - LEP 2010
 - Waterways
 - Waterbodies
- Grid Connections:**
- Existing Shared Path
 - Existing On Road Cycleway
 - Proposed Active Transport
 - Local Green Grid
 - 2.22 Priority Future Connections
- Great West Walk:**
- 2.10 Main Routes
 - Local loop & links



PRECINCT 2 - CENTRAL NORTH

CRANEBROOK, KINGSWOOD PARK, LEMONGROVE
PENRITH (NORTH OF RAILWAY LINE)

		Penrith Green Grid Plan Project Values				Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth Area	Urban Heat Effect Mitigation
PROJECT NAME	Suburb	Street Name	Category rating	(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)	(0-1)	
			West District Green Grid Project	PSRS Project	Total Value								
2.1	Cranebrook to Windsor Downs Nature Reserve Corridor, Wianamatta Nature Reserve , Castlereagh Nature Reserve , Windsor Downs Nature Reserve, Hawkesbury Council LGA , NPWS	Cranebrook	Cranebrook Road , Richard Road	5	1	1	2					1	
2.2	Rickabys Creek Waterway and Open Space Corridor	Cranebrook		5	1	1	2					1	
2.3	Castlereagh Road North South Link , planting along corridor to link to Penrith Lakes Parkland	Cranebrook	Castlereagh Road	5	2		2					1	
2.4	Andrews Road , planting along corridor from Northern Road to Castlereagh Road, cycle route to Penrith Lakes Parkland High Priority Wetland sites, including OI Glass Factory Ephemeral Wetland. East West Link	Penrith	Andrews Road	6	2	1	2					1	
2.5	Vincent Road Reserve, Andromeda Playing Fields, Linden Crescent Reserve	Cranebrook	Andromeda Crescent	3	2	1							
2.6	Henry Fulton Public School (walking catchment)	Cranebrook	Vincent Road	4					1	1	1	1	
2.7	Cranebrook to Windsor Downs Corridor, Shanes Park and Wianamatta Nature Reserve (NPWS)	Cranebrook	Vincent Road	4	2							1 1	
2.8	Corpus Christi Community and Catholic Primary School,Samuel Terry Public School (walking catchments)	Cranebrook	Andromeda Dr, Greys Lane	4					1	1	1	1	
2.9	Cranebrook Village, Community Centre, Tamara Childrens Centre, Braddock Public School, Cranebrook High School (walking catchments)	Cranebrook	Borrowdale Way,Laycock Street, Hosking Street	4					1	1	1	1	
2.10	Great West Walk linking Jordan Springs to Penrith Lakes	Cranebrook	Castlereagh Road,The Northern Road	6	2		2					1 1	
2.11	McHenry Road Wetland High Priority Wetland project	Cranebrook		1		1							
2.12	Former AFL Oval Near Sherringham Fields High Priority Wetland project	Cranebrook	Sherrington road	1		1							
2.13	Callisto Drive Wetland High Priority Wetland Project	Cranebrook	Callisto Drive	1		1							
2.14	Scopes Creek Wetland High Priority Wetland project (including Cranebrook Park walking catchments)	Cranebrook	between Boundary Road and Soling Crescent	1		1							
2.15	Cranebrook Road Wetland, Mountain View Reserve High Priority Wetland project (including Cranebrook Park walking catchments)	Cranebrook	Nepean Street	1		1							
2.16	Kingswood Park Village, Kingswood Park Public School	Kingswood Park	Caloola Ave, Kareela Ave.,Illawong Avenue	4					1	1	1	1	
2.17	Andrews Road Baseball Complex , connection via green/ hydrological space	Kingswood Park	Andrews Road	3		1					1	1	
2.18	Electrical Easement opportunity (east west connection)	Kingswood Park	Dunheved Road	6	2		2				1	1	
2.19	Penrith Rail Line Corridor from Penrith to Blacktown	Penrith		5			2				2	1	
2.20	Penrith Station north side (walking catchment)	Penrith		5			2			1	1	1	
2.21	Rickabys Creek Open Space Corridor (west) Priority Future North South Connection	Cranebrook		5	1	1	2					1	
2.22	Boundary Creek Priority Future East West Connection linking to Penrith Lakes	Penrith		5	1	1	2					1	
1.14	Penrith Lake Foreshore Links Priority Future Connection	Penrith		5	2	1		1				1	

Figure 23. Precinct 2 Green Grid Strategy Matrix

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

PRECINCT 3 EAST NORTH

Jordan Springs



Anticipated Change:

Medium level of change for the Central precinct as development proceeds and is finalised. Low level of change for the western precinct where development is largely complete.

Urban Temperature:

Suburbs recorded with high mean temperature during summer that should be targeted for reduction in urban heat island through greening: Jordan Springs.

Precinct Background:

Jordan Springs comprises two distinct zones – the established western portion and the developing planned subdivision in the east. These newly developed residential areas have existing street tree cover (to mature) and canopy planting within open and recreation spaces.

The Great West Walk passes through Jordan Springs from The Northern Road to Palmyra Avenue on the edge of Wianamatta Regional Park.

West District Green Grid Identified in West District Opportunity Cluster: *Refer Fig 8.

- **WD.1.5 South Creek and Ropes Creek***
- Ecological lands, a significant portion of the suburb is taken up by reserve and parkland, including the 400 ha Wianamatta Regional Park, which is administered by the National Parks and Wildlife Service.
- Transport corridor - *The Northern Road* and linkages to the *Great West Walk*.
- Waterway corridor linkages to *South/Ropes Creek*.

Penrith Green Grid Links and Actions:

- Distribution of open space is well planned and the majority of residents live within a 10 minute walk of open space.
- Investigate and advocate a regional reserve corridor in Jordan Springs to incorporate Ropes Crossing (Blacktown LGA) and South Creek to provide passive parklands, outdoor sport, creek and wetland open space.
- Reinforce Great West Walk route

Short Term Actions and Priority Projects:

3.1 Great West Walk greening from The Northern Road to Wianamatta Regional Park and South Creek.

Priority Future Connection:

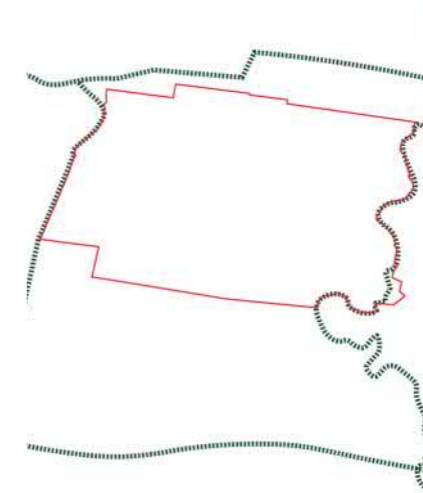
Ensure Jordan Springs East development incorporates Green Grid Strategy linkages to *South Creek* and *Wianamatta Regional Park*.

South Creek wetland corridor Voluntary Planning Agreement projects to align with Green Grid values.

Existing street trees to be monitored for growth and suitability.



Existing Tree Canopy



West District Green Grid



Mean Summer Air Temperature



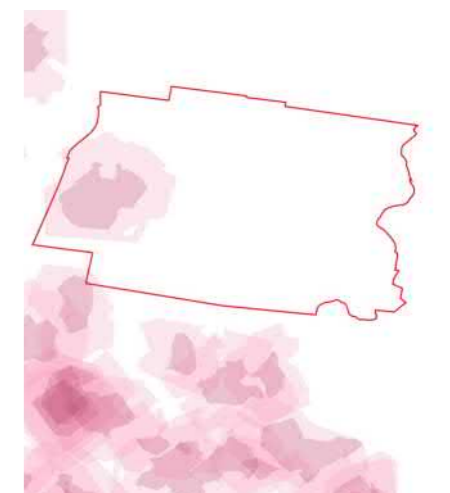
Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 24. Precinct 3 Key Layers

Precinct 3 Matrix & Plan



WEST DISTRICT GREEN GRID PROJECTS

- 2 South Creek
- 17 The Northern Road Green Boulevard: Badgerys Creek to Penrith
- 18 Shanes Park and Wianamatta Regional Park

KEY

- West District Green Grid
- Recreation & Open Space
- Ecological land
- Waterways
- Waterbodies
- Grid Connections:**
 - Existing Shared Path
 - Proposed Active Transport
 - Local Green Grid
- Great West Walk:**
 - Main Routes
 - Local loop & links



Figure 25. Precinct 3 Green Grid Strategy Plan

PRECINCT 3- NORTH EAST		JORDAN SPRINGS									
		Penrith Green Grid Plan Project Values									
			Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth Area	Urban Heat Effect Mitigation	
PROJECT NAME	Suburb	Street Name	Category rating	(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)
			West District Green Grid Project	PSRS Project	Total Value						
3.1	Great West Walk greening from The Northern Road to Wianamatta Regional Park and South Creek. Priority Future Project	Jordan Springs	Jordan Springs Blvd, Lakeside Parade , Bungendore St.	4	1	1			1	1	
3.2	Jordan Springs Recreation Precinct	Jordan Springs		5	2	1	1			1	

Figure 26. Precinct 3 Green Grid Strategy Matrix

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

PRECINCT 4 CENTRAL EAST

Cambridge Park, Cambridge Gardens, Werrington, Werrington County, Werrington Downs, Caddens, Claremont Meadows, Kingswood



Anticipated Change:

Low level of change in existing established suburbs. High levels of change concentrated around the currently undeveloped land in Werrington

Urban Temperature:

Suburbs recorded with high mean temperature during summer that should be targeted for reduction in urban heat island through greening: Cambridge Park, Werrington, Werrington County.

Precinct Background:

The Central East precinct is diverse comprising established and new release areas. Kingswood and Werrington south of the railway line are in the East West Economic Corridor which includes the Nepean Hospital Health and Western Sydney University education hubs. The area along the rail corridor is a significant employment hub and will continue to mature in conjunction with an increase in dwelling numbers.

There are numerous reserves ranging from passive parklands to natural areas, creeks and wetlands. These are strategic to creating open space connections linking the blue grid to recreation opportunities and neighbourhood centres.

West District Green Grid Identified in West District Opportunity Clusters: *Refer Fig 8.

- **WD 1.1 Penrith - St Marys**
- **WD.1.5 South Creek and Ropes Creek***
- Waterway corridors include *Werrington Creek* and *South Creek (WDGG)*.
- Transport corridors include *Penrith Rail Line*, *Great Western Highway*, *Sydney Metro-Western Sydney Airport* with stations at St Marys and Orchard Hills (tunnel between the two stations) and the future *M9 Outer Sydney Orbital*. The corridor for the *Outer Sydney Orbital* goes through this precinct for which a corridor has been consulted on but not yet finalised by the NSW Government

Penrith Green Grid Links and Actions:

Blue Grid Link - Werrington Creek network of open space and active transport connections to the CBD and east to South Creek. Priority

future connection along Claremont and Werrington Creeks linking from Precinct 11 (north south links across M4).

Extend open space connections through the existing creek corridors and suburbs. The 40 ha Gipps Street Recreation Precinct will be delivered in 2023. Significant green grid opportunity to link Claremont Creek and South Creek through recreational open space and create ecological linkages combining the rehabilitation of the hydrological corridors with connecting natural bushland to the north and south.

Co-ordinate active transport routes with Green Grid implementation.

Implement Green Grid to neighbourhood centres, education precincts and linking to sport, recreation and play areas.

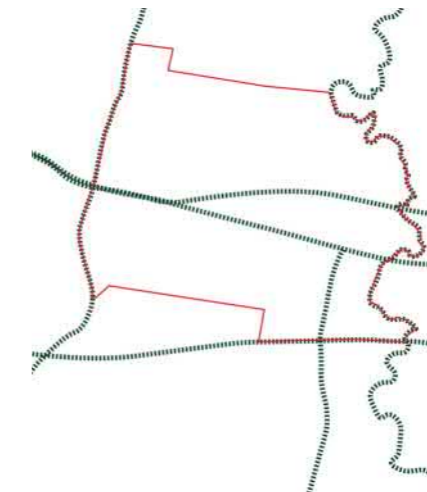
Development proposals to incorporate Green Grid and Cooling the City Strategy values.

Short Term Actions and Priority Projects:

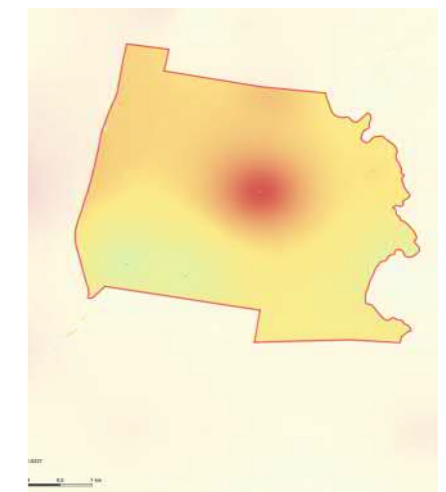
- 4.2 Cambridge Park High School, Devon Park, Harrow Road, William Street local park (walking catchment)
- 4.3 Werrington Creek, from South Creek, incl. Shaw Park, Harold Corr Oval, Werrington Creek Park to Caddens Road (walking catchment and creek rehabilitation) (portions in private ownership) (WDGGP) (PSRS)



Existing Tree Canopy



West District Green Grid



Mean Summer Air Temperature

4.4 Werrington Creek, shared path and creek restoration from Victoria Street, under Penrith Rail Line Corridor to Cosgrove Crescent Part of project 4.3. (WDGGP) (PSRS) (Priority Project)

4.5 South Creek to Western Motorway (walking catchment) (WDGGP)

4.6 Gipps Street Reserve open space and hydrological link connecting from Claremont Creek to South Creek (Part of 4.5) (PSRS)

4.7 Cambridge Park Shops, Cambridge Park Public School, Allsopp Oval, Lincoln Park Drive Park (walking catchments)

4.12 Claremont Creek corridor incl. The Kingsway, Myrtle Roads Fields from South Creek to Western Motorway (WDGGP) (PSRS) Wollemi College, Kurrambee School.

4.17 Claremont Meadows Shops, Claremont Meadows Public School, Myrtle Road Fields (walking catchments)

Priority Future Connections:

11.24 Claremont and Werrington Creeks linking to Precinct 11 - North South Links across M4. Priority future connection



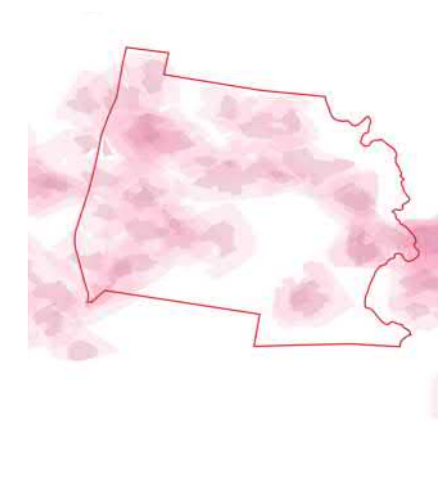
Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 27. Precinct 4 Key Layers

Precinct 4 Matrix & Plan

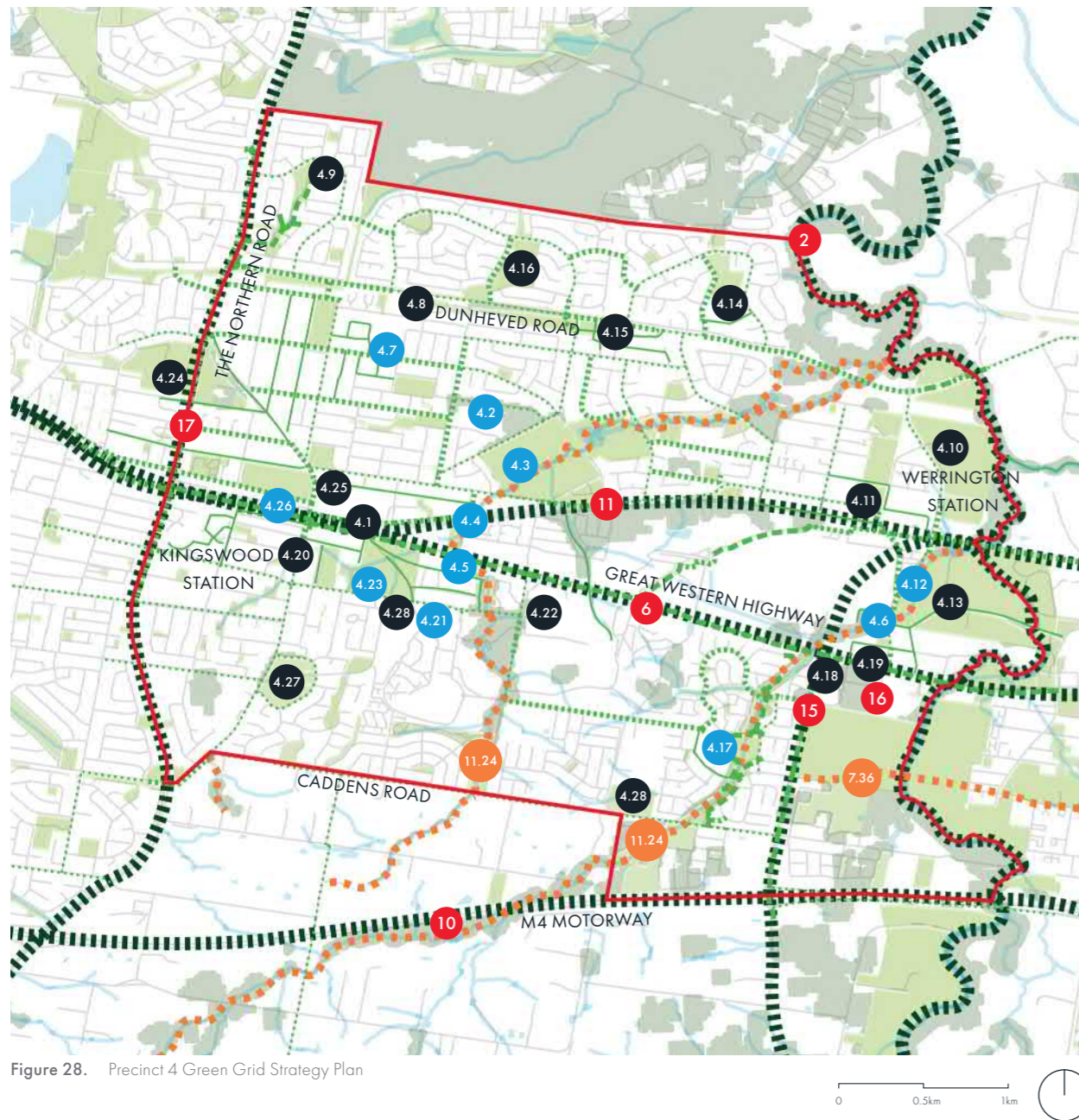


Figure 28. Precinct 4 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 2 South Creek
- 6 Great Western Highway: Penrith to Parramatta Easements
- 10 M4 Western Motorway Corridor Open Space
- 11 Penrith Rail Line Corridor from Penrith to Blacktown
- 15 Sydney Metro (South West Rail Link Extension): St. Marys to Badgerys Creek
- 16 M9 Outer Sydney Orbital corridor (alignment to be confirmed)
- 17 The Northern Road Green Boulevard: Badgerys Creek to Penrith



KEY

- West District Green Grid
 - 4.5 Priority Green Grid Project
 - 4.1 Green Grid Project
 - Recreation & Open Space
 - Ecological land
 - Waterways
 - Waterbodies
- Grid Connections:**
- Existing Shared Path
 - Existing On Road Cycleway
 - Proposed Active Transport
 - Local Green Grid
 - 7.36 Priority Future Connections

Penrith Green Grid Plan Project Values

PROJECT NAME	Suburb	Street Name	Category rating	Penrith Green Grid Plan Project Values										
				Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth Area	Urban Heat Mitigation			
				West District Green Grid Project	PSRS Project	Total Value	(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)
4.1 Penrith Rail Line Corridor from Penrith to Blacktown	Cambridge Park, Werrington, Kingswood					4			2				1	1
4.2 Cambridge Park High School, Devon Park, William Street local park (walking catchment)	Cambridge Park	Harrow Road, Cambridge street, William Street				6	2				1		1	1
4.3 Werrington Creek , from South Creek , incl. Shaw Park, Harold Corr Oval, Werrington Creek Park to Caddens Road (walking catchment and creek rehabilitation) (portions in private ownership)	Cambridge Park	Herbert Street				9	2	2		2		1	1	1
4.4 Werrington Creek, shared path and creek restoration from Victoria Street , under Penrith Rail Line Corridor to Cosgrove Crescent Part of project 4.3. (Priority Project)	Cambridge Park, Werrington, Caddens, Kingswood	Victoria Street				9	2	2		2		1	1	1
4.5 South Creek to Western Motorway (walking catchment) (South Creek Link in District Green Grid)	Cambridge Park, Werrington, Caddens, Kingswood					8	2	1		2		1	1	1
4.6 Gipps Street Reserve open space and hydrological link connecting from Claremont Creek to South Creek (Part of 4.5)	Werrington, Claremont Meadows, Kingswood	Gipps Street				8	2	1		2		1	1	1
4.7 Cambridge Park Shops, Cambridge Park Public School, Allsopp Oval, Lincoln Park Drive Park (walking catchments)	Cambridge Park	Oxford Street, Lincoln Park Drive				8	2			2	1	1	1	1
4.8 Open space and hydrological corridor - Dunheved Road to Wianamatta Regional Park	Werrington Downs	Dunheved Road				5		1		2			1	1
4.9 Cambridge Gardens Public School, Coronation Grove local park, Open space network from Trinity Drive to Lewis Road. (walking catchment)	Cambridge Gardens	Trinity Drive, Coronation Grove				4	2						1	1
4.10 Colonial Golf Course and Footgolf Course and RE1 Lands including creek tributary from Werrington Creek, on the western side of Werrington Road (adjoins South Creek)	Werrington	Werrington Road				4	2						1	1
4.11 Werrington Train Station . Werrington Shopping Centre, Rance Oval, Parkes Avenue Sporting Complex (walking catchments)	Werrington	Railway Street , Victoria Street, Parkes Avenue				4			2				1	1
4.12 Claremont Creek corridor incl. The Kingsway, Myrtle Roads Fields from South Creek to Western Motorway Wollemi College, Kurrambee School.	Werrington, Claremont Meadows	Werrington Road				9	2	2		2	1		1	1
4.13 The Kingsway Rugby Fields (walking catchment)	Werrington	The Kingsway				4	2						1	1
4.14 Werrington County Public School (walking catchment)	Werrington County	John Batman Ave.				3					1		1	1
4.15 Werrington Downs Shops (walking catchment)	Werrington Downs	Dunheved Road				5			2			1	1	1
4.16 Jim Anderson Park, greening and open space links from Stone Place to Valleyview Crescent and (walking catchment)	Werrington Downs	Brookfield Ave.				5	2					1	1	1
4.17 Claremont Meadows Shops, Claremont Meadows Public School, Myrtle Road Fields (walking catchments)	Claremont Meadows	Sunflower Drive				6	2				1	1	1	1
4.18 Sydney Metro-Western Sydney Airport Stations at St Marys and Orchard Hills. Metro will be a tunnel between the two stations.	Werrington, Kingswood, Caddens (tunnel)					3			2				1	
4.19 M9 Outer Sydney Orbital (Alignment to be confirmed)	Caddens , Orchard Hills					1							1	
4.20 Kingswood Train Station (walking catchment) and to Nepean Hospital Precinct (walking catchment)	Kingswood	GWHighway, Somerset Street				5			2				1	1
4.21 Kingswood Train Station to Western Sydney University Kingswood, Werrington Campus to be consolidated to Kingswood	Kingswood	Great Western Highway, Chapman Gardens, Second Avenue				7	1		2	1	1		1	1
4.22 TAFE NSW -Nepean Kingswood (walking catchment)	Kingswood	O'Connell Street				4				1	1		1	1
4.23 Doug Rennie Field, Chapman Gardens Oval, Chapmans Gardens, Kingswood Public School Second Avenue, First St, Stanley Crescent, Bringelly Road (walking catchment)	Penrith	Second Avenue				6	2			1	1		1	1
4.24 Parker Street Reserve, Kanangra Reserve (walking catchment)	Kingswood	King Street				4	2						1	1
4.25 St Josephs Primary School, St Dominics College (walking catchments)	Kingswood	Richmond Road , Gascoigne Street				3					1		1	1
4.26 Kingswood Train Station to Kingswood High School, Kingswood South Public School via streets and open space network (walking catchment)	Kingswood	Bringelly Road. Plunkett Crescent link to Elizabeth Crescent, Clemson Street, open space to Derby Street				6	1		2		1		1	1
4.27 Peppermint Reserve, Manning Street Reserve, Casuarina Circuit Reserve (walking catchment)	Kingswood	Peppermint Crescent, Manning Street, Casuarina Circuit				4	2						1	1
4.28 Caddens Oval (walking catchment)	Kingswood	Caddens Road				4	2						1	1
7.36 Hydrological easement from Wilson Street to Fowler Street to South Creek	St Marys	Wilson Street, Fowler Street				5	1	1		2				1
11.24 Claremont and Werrington Creeks and other connections linking to Precinct 4 - North South Links across M4.	Kingswood, Claremont Meadows					8	2	2		2			1	1

Figure 29. Precinct 4 Green Grid Strategy Matrix

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

PRECINCT 5 CENTRAL

Jamisontown, South Penrith, Penrith (South of Railway Line)



Anticipated Change:

High level of change for the Penrith CBD. Low level of change for the established areas of South Penrith and Jamisontown.

Urban temperature:

CBD of Penrith towards Kingswood, South Penrith and Jamisontown identified as one of the highest risk areas for public health where population density is high.

Precinct Background:

Established Penrith City centre is part of the East West Economic Corridor with a projected increase in jobs and investment associated with developing employment hubs and will therefore experience higher levels of growth and development. The Green Grid should be interwoven with planned growth to strengthen the amenity for those who live, visit and work in Central Precinct.

West District Green Grid Identified in West District Opportunity Clusters: *Refer Fig 8.

- **WD 1.1 Penrith - St Marys suburban corridor**
- **WD 1.2 Nepean River, Penrith***
- Waterway corridor and open space linkages - *The Great River Walk : The Hawkesbury Nepean River and Penrith Lakes Parklands, Nepean Creeks of Mulgoa, Surveyors Creek and Peach Tree Creek*
- Transport corridors - *Great Western Highway: Penrith to Blackheath Cycle Link, M4 Western Motorway Corridor Open Space, The Northern Road Green Boulevard: Badgerys Creek to Penrith, Penrith Rail Line Corridor from Penrith to Blacktown.*

- Parkland corridor - *Jamison Park and South Penrith Open Space Corridor*
- Former Infrastructure - *Penrith CBD and Hospital to the River Green Links*
- Urban Centre Links - *Penrith Lakes Parklands*

Penrith Green Grid Links and Actions:

- Complete linkages to the Nepean River and Penrith Lakes Parklands by reinforcing east west connections between suburbs, recreation open space and the CBD.
- Implement grid projects that link key destinations to Penrith Train Station and Yandhai Bridge.

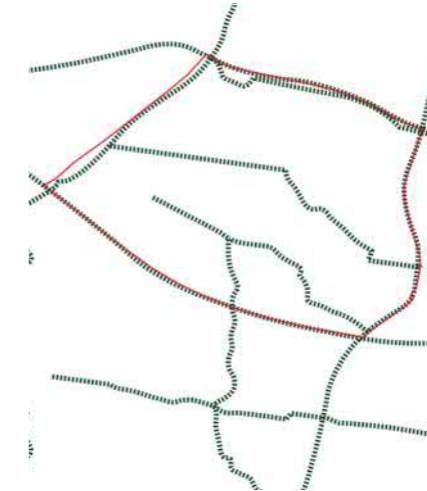
- Create cycle and walking linkages along the rail corridor and Great Western Highway to assist in improved connections to the CBD and the Health and Education precincts to the east in Kingswood and Werrington.
- Create linkages to reserves and parklands along creek corridors.
- Incorporate Green Grid and Cooling the City Strategy values into employment and residential hubs.
- Co-ordinate active transport routes with Green Grid implementation.
- Implement Green Grid to CBD as a priority.
- Continue to implement the 'Our River Masterplan'.
- Develop Peach Tree Creek Precinct as part of the *Jamison Road Open Space Corridor*

Short Term Actions and Priority Projects:

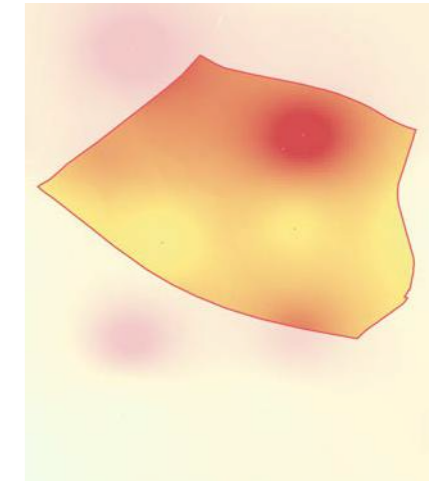
- 5.6 High Street Shopping Precinct(walking catchment)
- 5.7 Great Western Highway - Mulgoa Road to Parker Street (WDGGP)
- 5.9 Union Road- Mulgoa Road to Station Street, to Peach Tree Creek. Worth Street, Rodley Avenue -Mulgoa Road to pedestrian connection to Union Road (Future)
- 5.10 Penrith Train Station to Panthers Penrith Rugby Leagues Club and Jamison Open Space Corridor North South Link (WDGGP) North South Link



Existing Tree Canopy



West District Green Grid



Mean Summer Air Temperature

5.14 Penrith Train Station to Yandhai Nepean Crossing. Great Western Highway to Castlereagh Street, High Street, Ladbury Avenue, Memorial Avenue, planting opportunities to reinforce connection. East West Link (WDGGP)

5.15 Great River Walk , Nepean Avenue, Yandhai Bridge north to weir and Cassola Place (Precinct 2)

5.16 Jamison Road Link connecting to Tench Reserve and Great River Walk. (WDGGP) Mulgoa Road to Tench Reserve (Priority Project)

5.17 Surveyors Creek open space and hydrological connections (concrete channel) naturalisation, biodetention, WSUD opportunities, pathway links .(PSRS) Naturalisation of section from Ikin street to M4 Western motorway (Priority Project)

5.18 Peach Tree Creek open space and hydrological corridor Great Western Highway to Jamison Road (PSRS) East West Links (Catalyst Project)

5.19 Ripples Public Swimming Pool, part of Penrith Train Station to Panthers Stadium and Jamison Open Space Corridor (WDGGP) (Priority Project)

5.23 Jamison Park to Maxwell Street Open Space Corridor (blue) linkage, planting opportunities (walking catchment)(WDGGP) (PSRS)



Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 30. Precinct 5 Key Layers

Precinct 5 Matrix & Plan

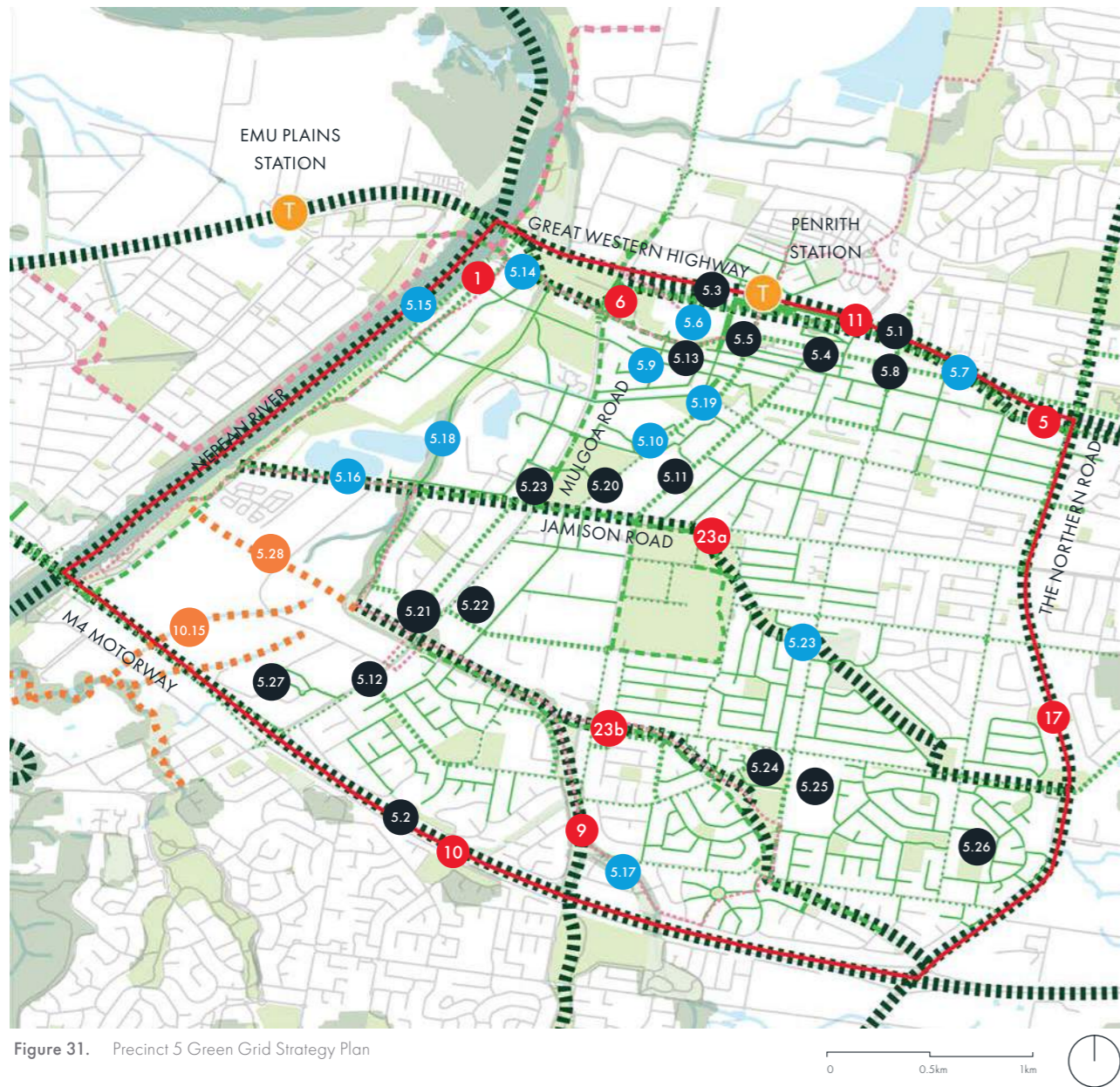


Figure 31. Precinct 5 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 1 The Great River Walk : The Hawkesbury Nepean River
- 5 Penrith CBD and Hospital to the River Green Links
- 6 Great Western Highway: Penrith to Parramatta Easements
- 9 Nepean Creeks incl. Mulgoa Ck and Surveyors Ck
- 10 M4 Western Motorway Corridor Open Space
- 11 Penrith Rail Line Corridor from Penrith to Blacktown
- 17 The Northern Road Green Boulevard: Badgerys Creek to Penrith
- 23 a) Jamison Park and b) South Penrith Open Space Corridors



KEY

- West District Green Grid
- 5.6 Priority Green Grid Project
- 5.2 Green Grid Project
- Recreation & Open Space
- Ecological land
- Waterways
- Waterbodies
- Grid Connections:**
 - Existing Shared Path
 - Existing On Road Cycleway
 - Proposed Active Transport
 - Local Green Grid
 - 10.15 Priority Future Connections
- Great West Walk:**
 - Main Routes
 - Local loop & links

Note: Refer to matrix on following page for project scoring.

PRECINCT 5 - CENTRAL

JAMISONTOWN, SOUTH PENRITH, PENRITH (SOUTH OF RAILWAY LINE)

PROJECT NAME		Suburb	Street Name	Category rating	Penrith Green Grid Plan Project Values									
					Recreational space and connections (0-2)	Riparian / Ecological corridor (0-1)	Train / Metro Station connection (0-2)	Active Transport Route, existing or proposed (0-2)	Education/ Health Precinct Connection (0-1)	Local Centre Greening or Connection (0-1)	Existing Population and/or Future Growth Area (0-1)	Urban Heat Effect Mitigation (0-1)		
					West District Green Grid Project	PSRS Project	Total Value							
5.1	Penrith Rail Line Corridor from Penrith to Blacktown	Penrith					4		2				1	1
5.2	M4 Western Motorway Corridor Open Space	Jamisontown					2						1	1
5.3	Penrith Train Station (walking catchment)	Penrith					4		2				1	1
5.4	Penrith Train Station to Penrith Public School and Penrith Selective High School High Street -High Street from Evans Street to Colless (and walking catchment)	Penrith	High Street				5		2		1		1	1
5.5	Central Business District -Green roofs future development						3					1	1	1
5.6	High Street Shopping Precinct(walking catchment)	Penrith	from Evan Street to Westfields				7		2	2		1	1	1
5.7	Great Western Highway - Mulgoa Road to Parker Street	Penrith	Great Western Highway				6		2	2			1	1
5.8	Henry Street - Riley Street to Evan Street	Penrith	Henry Street				3					1	1	1
5.9	Union Road-Mulgoa Road to Station Street, to Peach Tree Creek. Worth Street, Rodley Avenue -Mulgoa Road to pedestrian connection to Union Road (Future)	Penrith	Union Road, Rodley Avenue				6	2	1			1	1	1
5.10	Penrith Train Station to Panthers Penrith Rugby Leagues Club and Jamison Open Space Corridor North South Link North South Link	Penrith	Station Street				9	2	2	2		1	1	1
5.11	Woodriff Street - Jamison Road to CBD future cycle link	Penrith	Woodriff Street				4			2			1	1
5.12	Mulgoa Road -Great Western Highway to Western Motorway	Penrith	Mulgoa Road				4			2			1	1
5.13	Union Road carpark , planting opportunity , potential redevelopment site	Penrith	Union Lane, Union Road				2						1	1
5.14	Penrith Train Station to Yandhai Nepean Crossing. Great Western Highway to Castlereagh Street, High Street, Ladbury Avenue, Memorial Avenue, planting opportunities to reinforce connection. East West Link	Penrith	Jane Street , Great Western Highway , High Street, Memorial Avenue link to River Walk				9	2	2	2		1	1	1
5.15	Great River Walk , Nepean Avenue, Yandhai Bridge north to weir and Cassola Place (Precinct 2)	Penrith	Nepean Avenue				6	2		2			1	1
5.16	Jamison Road Cycle Link Connecting Mulgoa Road to Tench Reserve and Great River Walk.	Penrith , Jamisontown, South Penrith	Jamison Road				7	2		2		1	1	1
5.17	Surveyors Creek open space and hydrological connections (concrete channel) naturalisation, biodetention, WSUD opportunities, pathway links .(PSRS) Naturalisation of section from Ikin Street to M4 Western motorway	Penrith , Jamisontown, South Penrith	Jamison Road to Western Motorway				8	2	1	2		1	1	1
5.18	Peach Tree Creek open space and hydrological corridor Great Western Highway to Jamison Road (PSRS) East West Links (Catalyst Project)	Penrith, South Penrith					8	2	1	2		1	1	1
5.19	Ripples Public Swimming Pool, Car park greening, part of Penrith Train Station to Panthers Stadium and Jamison Open Space Corridor	Penrith	Station Street				9	2	2	2		1	1	1
5.20	Panthers Stadium, Nepean Village, Nepean Square (walking catchments)	Penrith	Station Street				5			2		1	1	1
5.21	Panthers Penrith Rugby Leagues Club, Krispy Kreme, McDonalds, KFC , Outback Steakhouse- carpark planting opportunities (walking catchment)	Penrith	Mulgoa Road				3					1	1	1
5.22	Mulgoa Road Enterprise Corridor (future)	Penrith	Mulgoa Road				3					1	1	1
5.23	Jamison Park to Maxwell Street Open Space Corridor (blue) linkage, planting opportunities (walking catchment)	South Penrith	Greenhills Avenue, Evan Street, Cardinia Drive, Greenway Drive, Braemar Drive				7	2	1	2		1	1	
5.24	Southlands Shopping Centre South Penrith (walking catchment)	South Penrith	Birmingham Road				3					1	1	1
5.25	Maxwell Street - York Road to The Northern Road , Jamison Public School, Jamison High School, York Public School, Robinson Park, Southland Oval (walking catchments)	South Penrith, Jamiston	Maxwell Street , Thurwood Avenue, Evan Street, Glenbrook Street.				5	1			1	1	1	1
5.26	St Mary Mackillop Primary School (walking catchment)	South Penrith	Fragar Road				4			1		1	1	1
5.27	Penrith Homemakers Centre-carpark planting opportunity (walking catchment)	Jamisontown	Mulgoa Road				2						1	1
5.28	Surveyors Creek to Nepean River	Penrith , Jamisontown, Penrith	South Blaikie Road, Tench Ave				8	2	1	2		1	1	1
10.15	School House Creek from Mulgoa Road to Nepean River, shared path within Council owned land and road easement connection to Factory Road. Priority Future Connection	Regentville					8	2	1	2		1	1	1

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix Priority projects are those that score a total value of 6 or more.

Figure 32. Precinct 5 Green Grid Strategy Matrix

PRECINCT 6 CENTRAL WEST

Emu Heights, Emu Plains, Leonay



Anticipated Change:
Low level of change

Urban temperature:
Emu Plains and Emu Heights identified as one of the highest risk areas for public health where population density is high.

Precinct Background:
Well established precinct to the west of the Nepean River and east of the Blue Mountains. Leonay and Emu Heights largely residential. Emu Plains has a mixture of residential, employment and industrial precincts

West District Green Grid Identified in West District Opportunity Cluster: *Refer Fig 8.

- **WD1.2 Nepean River, Penrith***
- Waterway corridor - *The Great River Walk : The Hawkesbury Nepean River*
- Transport corridors - *Great Western Highway: Penrith to Blackheath Cycle Link and the M4 Western Motorway Corridor Open Space*

Penrith Green Grid Links and Actions

- Establish improved linkages to Regatta Park and 'Our River Masterplan'
- Improve linkages from Emu Plains Train Station Precinct to the Nepean River and to the Yandhai Bridge river crossing.
- Improve active transport linkages to the Nepean Creative and Performing Arts High School.
- Reinforce Great West Walk route along Nepean River and through Emu Plains.

Short Term Actions and Priority Projects:

6.2 Great Western Highway: Penrith to Blackheath Cycle Link (WDGGP) Section in Emu Plains (Priority Project)

6.9 Emu Plains Railway Station (walking catchment) link to River, Commuter carparks north and south , planting opportunity (Priority Project)

6.10 Emu Plains Shopping Village (walking catchment) link to River, carparks- planting opportunities -(Part of Priority Project 6.09)

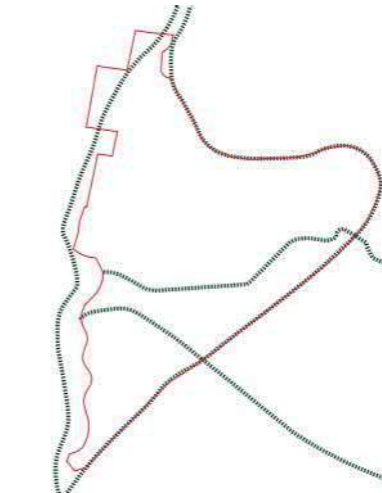
6.11 Nepean Creative and Performing Arts High School (walking catchment) link to Train Station and River. GWH part of Priority Project 6.02.

Priority Future Connections:

6.18 Russell Street from Old Bathurst Road to Nepean River.



Existing Tree Canopy



West District Green Grid



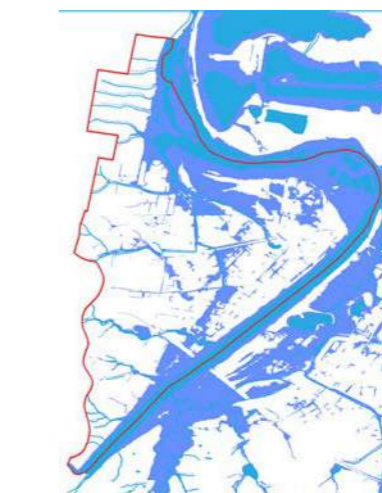
Mean Summer Air Temperature



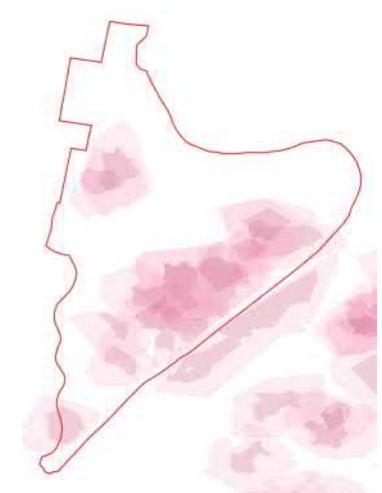
Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 33. Precinct 6 Key Layers

Precinct 6 Matrix & Plan

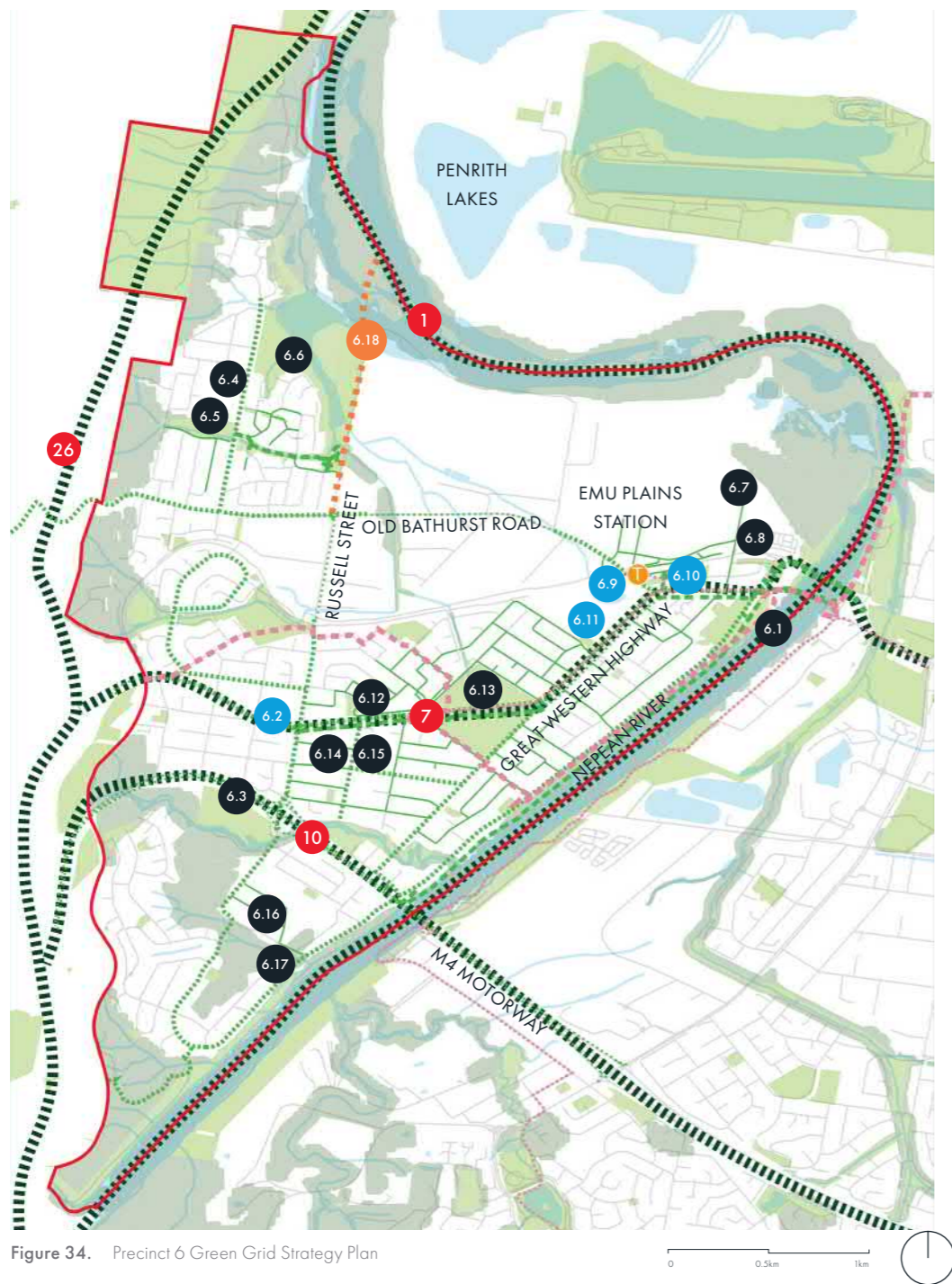


Figure 34. Precinct 6 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 1 The Great River Walk : The Hawkesbury Nepean River
- 7 Great Western Highway: Penrith to Blackheath Cycle Link
- 10 M4 Western Motorway Corridor Open Space
- 26 Eastern Escarpment Open Space Trails

KEY

- West District Green Grid
 - 6.2 Priority Green Grid Project
 - 6.1 Green Grid Project
 - Recreation & Open Space
 - Ecological land
 - Waterways
 - Waterbodies
- Grid Connections:**
- Existing Shared Path
 - Existing On Road Cycleway
 - Proposed Active Transport
 - Local Green Grid
 - 6.18 Priority Future Connections
- Great West Walk:**
- Main Routes
 - Local loop & links



Note: Refer to matrix on following page for project scoring.

PRECINCT 6 - CENTRAL WEST

EMU HEIGHTS, EMU PLAINS , LEONAY

Penrith Green Grid Plan Project Values

PROJECT NAME	Suburb	Street Name	West District Green Grid Project	PSRS Project	Total Value	Category rating							
						(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)
						Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth	Urban Heat Effect Mitigation
6.1 The Great River Walk : The Hawkesbury Nepean River	Emu Plains, Leonay				5	1			2			1	1
6.2 Great Western Highway: Penrith to Blackheath Cycle Link Section in Emu Plains linking to Emu Plains Train Station	Emu Plains	Imperial Avenue			7	1			2	1	1	1	1
6.3 M4 Western Motorway Corridor Open Space	Emu Plains, Leonay				2						1		1
6.4 Emu Heights Public School, Clissold Park (walking catchment)	Emu Heights	Wedmore Road			5	2				1	1		1
6.5 East West open space corridor between Clissold Reserve and Emu Green Reserve	Emu Heights	Palomino Road and Russell Street			4	2	1						1
6.6 Spring Frost Reserve , Emu Green Reserve, Lapstone Creek corridor	Emu Heights	Wedmore Road			4	2	1						1
6.7 CathWest Innovation College -McCarthy (Link to Emu Plains Station)	Emu Plains	Mackellar Street			4			2		1			1
6.8 Penola Catholic College (Link to Emu Plains Station)	Emu Plains	Mackellar Street			4			2		1			1
6.9 Emu Plains Car Park (walking catchment) link to River, Commuter carparks north and south , planting opportunity	Emu Plains	Station Street,			8	2		2	1		1	1	1
6.10 Emu Plains Shopping Village (walking catchment) link to River, carparks- planting opportunities -(Part of Priority Project 6.09)	Emu Plains	Great Western Highway , Station Street, Billington Street			8	2		2	1		1	1	1
6.11 Nepean Creative and Performing Arts High School (walking catchment) link to Train Station and River.GWH in Priority Project 6.02.	Emu Plains	Great Western Highway			8	2		2	1	1		1	1
6.12 Lennox Village Shopping Village, green space adjoining shopping centre and carparks-planting opportunity (walking catchment)	Lennox Village	Water Street			3						1	1	1
6.13 Dukes Oval, Darcy Smith Oval, Hunter Fields (walking catchment)	Lennox Village, Emu Plains	Lawson Street, Park Street.			5	2	1				1		1
6.14 Our Lady of the Way Primary School (walking catchment)	Emu Plains	Forbes Street			3					1	1		1
6.15 Emu Plains Public School (walking catchment)	Emu Plains	Emerald Street			3					1	1		1
6.16 Leonay Public School (walking catchment)	Leonay	Buring Ave, Leonay Parade			3					1	1		1
6.17 Leonay Oval, Jamison Creek connection to Nepean River (walking catchment)	Emu Plains	Nepean Street			4	2	1				1		
6.18 Russell Street from Old Bathurst Road to Nepean River	Emu Plains	Russell Street			4	2			2				

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

Figure 35. Precinct 6 Green Grid Strategy Matrix

PRECINCT 7 EAST 1

St Marys, North St Marys



Anticipated Change:

High level of change anticipated in the future in response to construction of the Sydney Metro Western Sydney Airport and renewal of Land and Housing Corporation housing stock.

Urban Temperature:

Suburbs recorded with high mean temperature during summer that should be targeted for reduction in urban heat island through greening. North St Marys

Precinct Background:

St Marys is within the East West Economic Corridor with the St Marys Sydney Metro station to be completed by 2026. St Marys will be the interchange point with the existing T1 Western Line and dwelling numbers are anticipated to increase consistent with the opportunity created by the Metro station.

West District Green Grid Identified in West District Opportunity Clusters: *Refer Fig 8.

- **WD 1.1 Penrith - St Marys**
- **WD.1.5 South Creek and Ropes Creek***
- Transport corridors- *Penrith Rail Line Corridor from Penrith to Blacktown, Sydney Metro (South West Rail Link Extension): St. Marys to Badgerys Creek and M9 Outer Sydney Orbital (future), The Northern Road Green Boulevard: Badgerys Creek to Penrith.* The corridor for the *Outer Sydney Orbital* goes through this precinct for which a corridor has been consulted on but not yet finalised by the NSW Government

Penrith Green Grid Links and Actions:

- Reinforce cross suburb east west linkages between South Creek and Ropes Creek.
- Co-ordinate active transport routes with Green Grid implementation.
- Implement Green Grid to St Marys CBD, neighbourhood centres, education precincts and linking to sport, recreation and play areas.
- Redevelopment proposals to incorporate Green Grid and Cooling the City Strategy values. Develop spatial frameworks/masterplans for priority projects identified in the Sydney Green Grid.

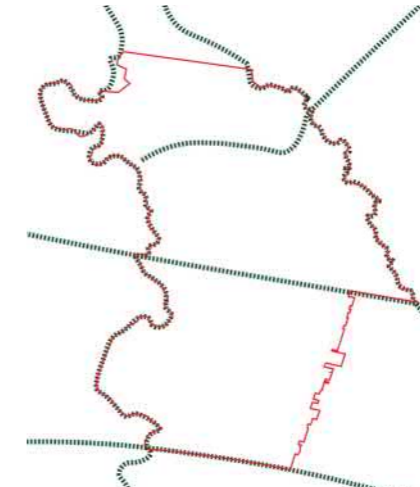
- *South Creek Corridor:* liaise with NSW Government to secure open space land and ensure environmental and sustainability benchmarks are met.

Short Term Actions and Priority Projects:

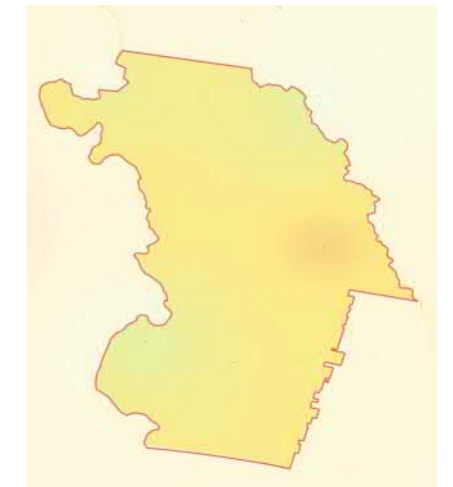
- 7.1 South Creek Corridor, Dunheved Golf Course to Western Motorway (WDGGP)
- 7.2 Byrnes Creek - From South Creek to Western Motorway, Cook Park, Main Soccer Field, Monfarville Reserve (walking catchment)
- 7.12 St Marys Station to St Marys Senior High School (walking catchment)
- 7.13 The Kingsway Rugby Fields, Penrith BMX Club, Blair Oval, St Mary's Tennis Club, South Creek Park, Claremont Creek and South Creek (walking catchment)
- 7.14 The Kingsway, shared path and planting to car spaces from Charles Hackett Drive to Werrington Road (Kurrambee School) South Creek Bridge Crossing for shared path. (Priority Project)
- 7.15 Chapel Street east west link to Charles Hackett Drive, Lang Park, Kokoda Park (Priority Project)
- 7.18 Charles Hackett Drive from Great Western Highway to Queen Street, shared path link to St Marys Village Shopping and St Marys Public School (Priority Project)



Existing Tree Canopy



West District Green Grid



Mean Summer Air Temperature

7.20 King Street, active transport linking Glossop Street to Queen Street past Bennett Park (Priority Project)

7.25 Debrincat Avenue Linking South Creek to Ropes Creek, and connected to St Marys Train Station. Debrincat Avenue active transport link from Ropes Creek to Glossop Street (Priority Project)

7.28 Chifley College Dunheved, Robin Wiles Park-planting opportunity (walking catchment)

Priority Future Connections:

- 7.30 South Creek active transport/hydrological/open space connection to Forrester Road (WDGGP)
- 7.31 Hydrological easement from South Creek through Industrial Estate, across Forrester Road to Kurrajong Road (WDGGP)
- 7.32 Hydrological easement from South Creek through Industrial Estate, from Kurrajong Road to Penrith Rail Line Corridor (WDGGP)
- 7.34 Chapel Street active transport: Link connecting to Precinct 8
- 7.35 Putland Street to South Creek active transport link
- 7.36 Hydrological easement from Wilson Street to Fowler Street to South Creek



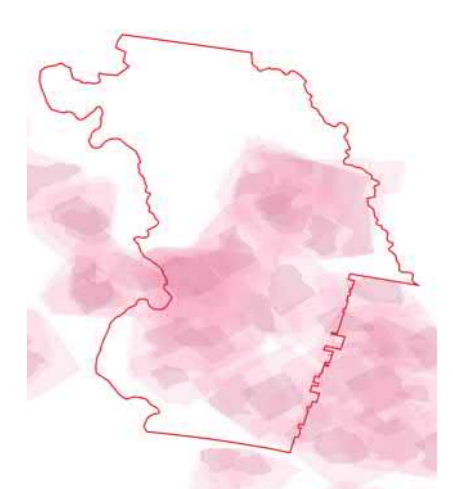
Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 36. Precinct 7 Key Layers

Precinct 7 Matrix & Plan

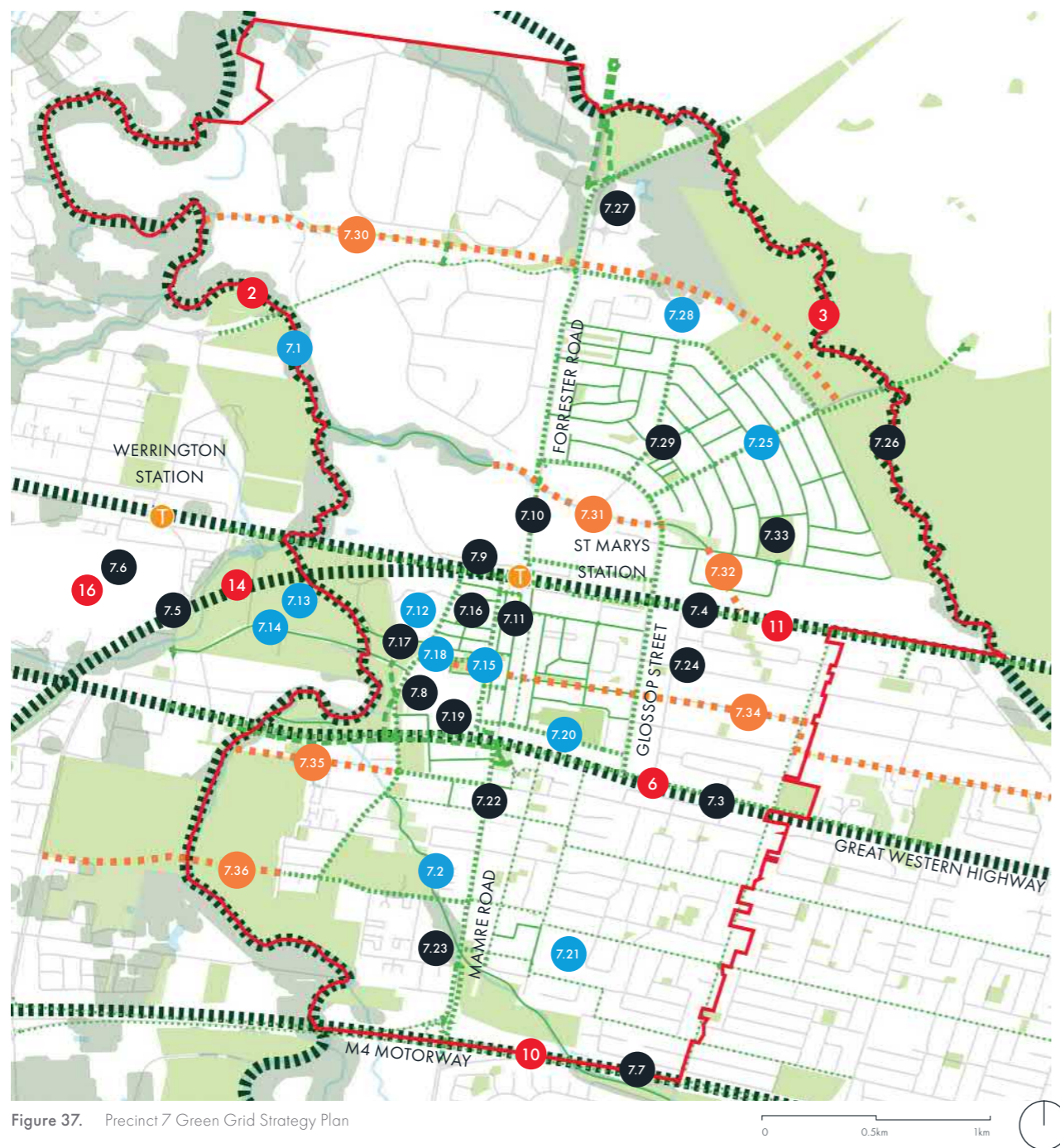


Figure 37. Precinct 7 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 2 South Creek
- 3 Ropes Creek
- 6 Great Western Highway: Penrith to Parramatta Easements
- 10 M4 Western Motorway Corridor Open Space
- 11 Penrith Rail Line Corridor from Penrith to Blacktown
- 14 North West Rail Link Extension: Rouse Hill to St. Marys
- 16 M9 Outer Sydney Orbital corridor (alignment to be confirmed)



KEY

- West District Green Grid
 - 7.1 Priority Green Grid Project
 - 7.5 Green Grid Project
 - Recreation & Open Space
 - Ecological land
 - Waterways
 - Waterbodies
- Grid Connections:**
- Existing Shared Path
 - Existing On Road Cycleway
 - Proposed Active Transport
 - Local Green Grid
 - 7.36 Priority Future Connections

Note: Refer to matrix on following page for project scoring.

Penrith Green Grid Plan Project Values

PROJECT NAME	Suburb	Street Name	Category rating	West District Green Grid Project	PSRS Project	Total Value	Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth Area	Urban Heat Effect Mitigation
							(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)
7.1 South Creek Corridor , Dunheved Golf Course to Western Motorway	St Marys		6			6	2	1		2			1	
7.2 Byrnes Creek - From South Creek to Western Motorway , Cook Park, Main Soccer Field, Monfarville Reserve (walking catchment)	St Marys		7			7	2	1		2		1	1	
7.3 Great Western Highway: Penrith to Parramatta Easement -east west Link	St Marys		4			4				2			1	1
7.4 Penrith Rail Line Corridor from Penrith to Blacktown	St Marys		4			4			2				1	1
7.5 North West Rail Link Extension: Rouse Hill to St. Marys, Sydney Metro-Western Sydney Airport	St Marys (tunnel)		3			3			2				1	
7.6 M9 Outer Sydney Orbital (Alignment to be confirmed)	St Marys		3			3				2			1	
7.7 M4 Western Motorway Corridor Open Space	St Marys		4			4				2			1	1
7.8 St Marys CBD carparks (future redevelopment sites)	St Marys		2			2							1	1
7.9 St Marys Metro Station (Sydney Metro-Western Sydney Airport (future)	St Marys		4			4			2				1	1
7.10 St Marys Train Station to Industrial Estate along Kurrajong Road, car park planting	St Marys	Harris Street, Glossop Street, Kurrajong Road	4			4			2				1	1
7.11 St Marys Train station and Queen Street shopping precinct- Great Western Highway to St Marys Train Station (walking catchment)	St Marys	Queen Street	5			5			2			1	1	1
7.12 St Marys Station to St Marys Senior High School (walking catchment)	St Marys	Kalanga Ave.	6			6			2		1	1	1	1
7.13 The Kingsway Rugby Fields, Penrith BMX Club, Blair Oval , St Mary's Tennis Club, South Creek Park, Claremont Creek and South Creek (walking catchment)	St Marys	Werrington Road, The Kingsway, Creek Road , Penrith Rail Line corridor	6			6	2				1	1	1	1
7.14 The Kingsway , shared path and planting to car spaces from Charles Hackett Drive to Werrington Road (Kurrambee School) South Creek Bridge Crossing for shared path.	St Marys	The Kingsway	8			8	2			2	1	1	1	1
7.15 Chapel Street east west link to Charles Hackett Drive, Lang Park, Kokoda Park (Priority Project)	St Marys	Carinya Ave.	7			7	2		2			1	1	1
7.16 Jack Jewry Reserve (walking catchment)	St Marys	Merinda Street	5			5	2					1	1	1
7.17 Ripples St Marys Leisure Centre (walking catchment)	St Marys	Charles Hackett Drive	3			3						1	1	1
7.18 Charles Hackett Drive from Great Western Highway to Queen Street, shared path link to St Marys Village Shopping and St Marys Public School	St Marys	Charles Hackett Drive	8			8			2	2	1	1	1	1
7.19 St Marys Public School (walking catchment)	St Marys	Princes Mary Street	4			4					1	1	1	1
7.20 King Street , active transport linking Glossop Street to Queen Street past Bennett Park	St Marys	King Street	7			7	2			2		1	1	1
7.21 St Marys South Public School, Margaret Porter Reserve- planting opportunity (walking catchment)	St Marys	Monfarville Street	6			6	2				1	1	1	1
7.22 Our Lady of the Rosary Primary (walking catchment)	St Marys	Saddington Street	4			4					1	1	1	1
7.23 St Marys RSL carpark planting opportunity	St Marys	Hall Street	2			2							1	1
7.24 Brisbane/ Australia St corner park-planting opportunity (walking catchment)	St Marys	Brisbane/Australia St corner	3			3						1	1	1
7.25 Debrincat Avenue Linking South Creek to Ropes Creek, and connected to St Marys Train Station . Debrincat Avenue active transport link from Ropes Creek to Glossop Street	North St Marys	Debrincat Avenue, Glossop Street Harris Street, North St Marys residential streets	7			7	2			2		1	1	1
7.26 Ropes Creek corridor Boronia Park, Whalan Reserve (walking Catchment)	North St Marys	Boronia Road	5			5	2	1				1	1	
7.27 St Marys Rugby Leagues, carpark planting	North St Marys	Forrester Road	2			2							1	1
7.28 Chifley College Dunheved, Robin Wiles Park-planting opportunity(walking catchment)	North St Marys	Maple Road	6			6	2				1	1	1	1
7.29 St Marys North Public School, Wattle Park, North St Marys Shops, Tobruk Reserve (walking catchments)	North St Marys	Willow Road, Wattle Avenue, Parklawn Pl, Tobruk Street	5			5	1				1	1	1	1
7.30 South Creek active transport/hydrological/open space connection to Forrester Road	North St Marys	Dunheved Circuit	6			6	1	1		2			1	1
7.31 Hydrological easement from South Creek through Industrial Estate, across Forrester Road to Kurrajong Road	North St Marys	Forrester Road, Kurrajong Road.	3			3			1				1	1
7.32 Hydrological easement from South Creek through Industrial Estate, from Kurrajong Road to Penrith Rail Line Corridor	St Marys	Kurrajong Road	3			3			1				1	1
7.33 Poplar Park (walking catchment)	North St Marys	Poplar Street	5			5	2					1	1	1
7.34 Chapel Street active transport: Link connecting to Precinct 8	St Marys	Chapel Street, Canberra Street	5			5				2		1	1	1
7.35 Putland Street to South Creek active transport link	St Marys	Putland Street	5			5	1			2			1	1
7.36 Hydrological easement from Wilson Street to Fowler Street to South Creek	St Marys	Wilson Street, Fowler Street	5			5	1	1		2				1

Figure 38. Precinct 7 Green Grid Strategy Matrix

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

PRECINCT 8 EAST 2

Colyton, Oxley Park



Anticipated Change:

Low level of change anticipated in these established suburbs

Urban temperature: The urban heat map shows no singular heat spots, however, Colyton and Oxley Park identified as one of the highest risk areas for public health, due to the high population numbers in this area.

Precinct Background:

Well established precinct with good access to parklands and natural reserves within a 10 minute walking distance.

West District Green Grid Identified in West District Opportunity Cluster:

*Refer Fig 8.

- **WD.1.5 South Creek and Ropes Creek***
- Waterway corridor - *Ropes Creek* (also in West Central District Green Grid).

- Transport corridors - *Great Western Highway: Penrith to Parramatta Easements, M4 Western Motorway Corridor Open Space and Penrith Rail Line Corridor from Penrith to Blacktown.*

Penrith Green Grid Links and Actions:

- Strategic Plan for a walking and cycling network that links Ropes Creek westward to South Creek and north to the major parklands corridor of Whalan Reserve and Tregear in the Blacktown LGA.
- Co-ordinate active transport routes with Green Grid implementation.
- Implement Green Grid to neighbourhood centres, education precincts and linking to sport, recreation and play areas.

Short Term Actions and Priority Projects:

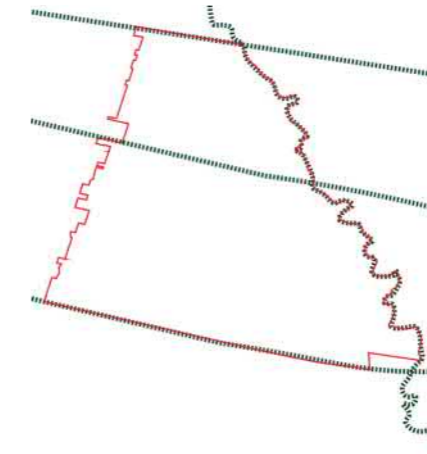
8.1 Ropes Creek recreational and hydrological corridor, incl. Kevin Dwyer Park from rail corridor, Great Western Highway to Western Motorway (WDGGP) Roper Road Green Corridor Masterplan (Priority Project)

Priority Future Connections:

8.18 Adelaide Street between Sydney Street and Ropes Creek



Existing Tree Canopy



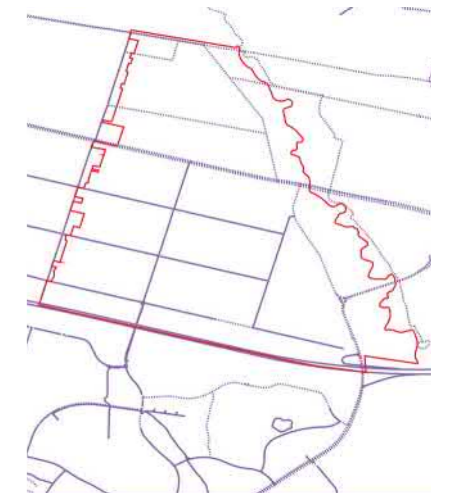
West District Green Grid



Mean Summer Air Temperature



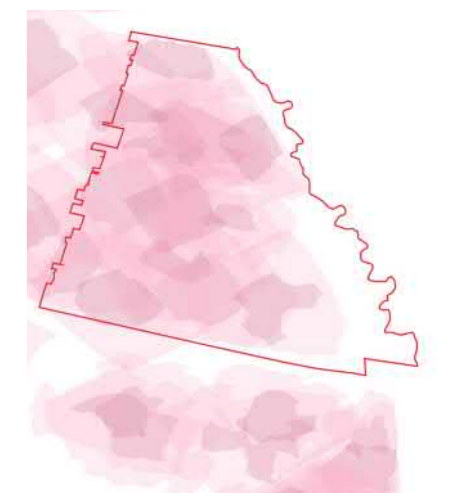
Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 39. Precinct 8 Key Layers

Precinct 8 Matrix & Plan

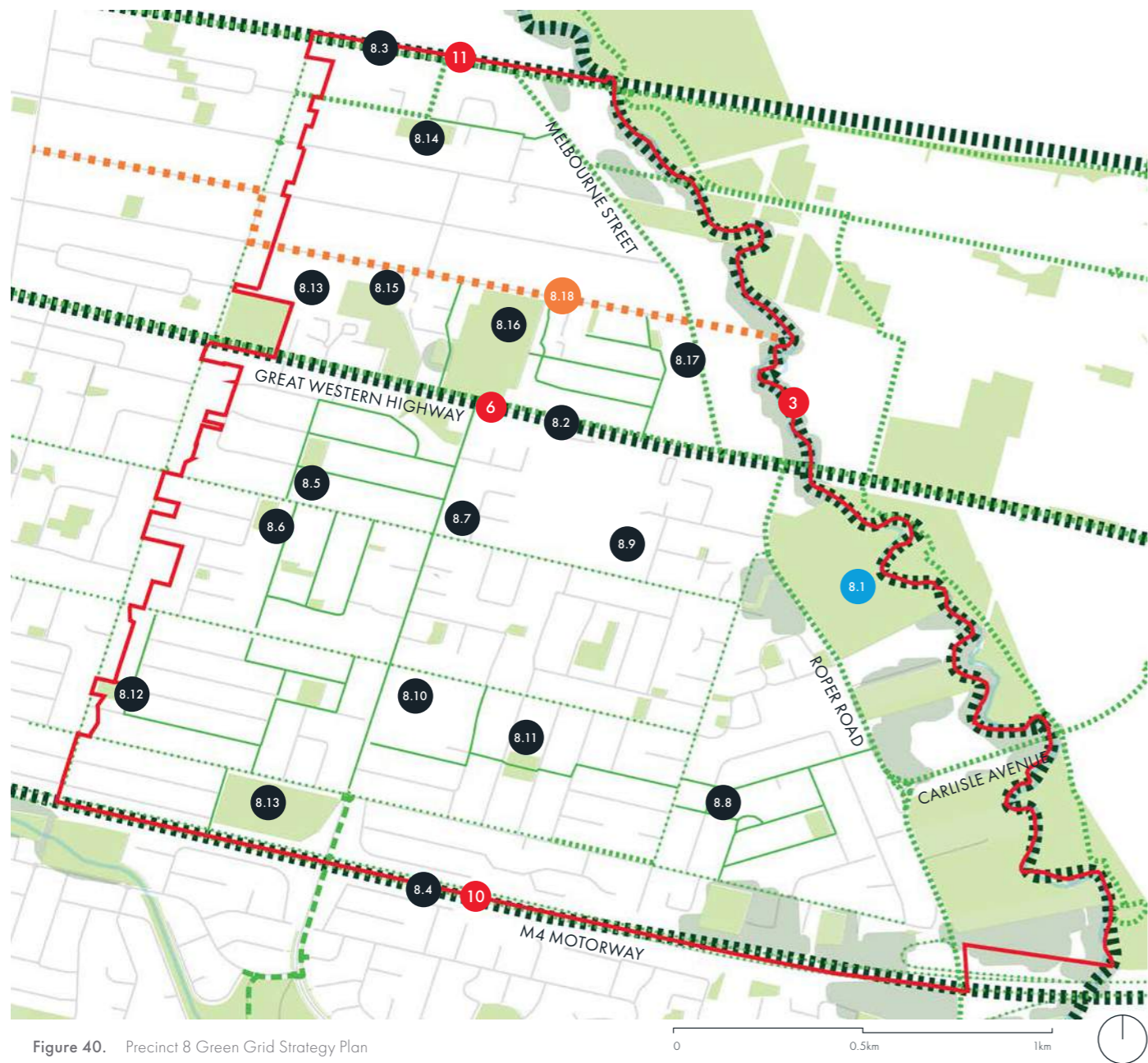


Figure 40. Precinct 8 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 3 Ropes Creek
- 6 Great Western Highway: Penrith to Parramatta Easements
- 10 M4 Western Motorway Corridor Open Space
- 11 Penrith Rail Line Corridor from Penrith to Blacktown

KEY

- West District Green Grid
- 8.1 Priority Green Grid Project
- 8.2 Green Grid Project
- Recreation & Open Space
- Ecological land
- Waterways
- Waterbodies
- Grid Connections:**
- Existing Shared Path
- Existing On Road Cycleway
- Proposed Active Transport
- Local Green Grid
- 8.18 Priority Future Connections



Note: Refer to matrix on following page for project scoring.

PRECINCT 8 - EAST 2

COLYTON, OXLEY PARK

Penrith Green Grid Plan Project Values

PROJECT NAME	Suburb	Street Name	Category rating	(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)	(0-1)
			West District Green Grid Project	PSRS Project	Total Value							
8.1 Ropes Creek recreational and hydrological corridor, incl. Kevin Dwyer Park from rail corridor , Great Western Highway to Western Motorway (WDGGP) Roper Road Green Corridor Masterplan (Priority Project)	Oxley Park, Colyton	Roper Road			7	2	1	2		1		1
8.2 Great Western Highway - Penrith to Parramatta Easements, East West Link	Oxley Park, Colyton				5			2		1	1	1
8.3 Penrith Rail Line Corridor from Penrith to Blacktown	Oxley Park, Colyton				3					1	1	1
8.4 M4 Western Motorway Corridor Open Space	Colyton				3					1	1	1
8.5 Colyton Shops (walking catchment)	Colyton	Corner of Day and Carpenter Streets			2					1		1
8.6 Kevin Maley Park, Alam Street reserve , Gunning Park, Parkin Road reserve, Mick Martin Park - greening and (walking ctachment)	Colyton	Carpenter Street, Alam St, Marsden Road, Leonard Street, Parkin Road			4	2				1		1
8.7 Convenience Store (walking catchment)	Colyton	Corner Bennett Road and Carpenter Street			2					1		1
8.8 Colyton Shopping Centre and Gilmore Street Park - planting opportunities (walking catchment)	Colyton	Hewitt Street. Gilmour Street			4	2				1		1
8.9 Colyton High School-planting opportunity school grounds (walking catchment)	Colyton	Carpenter Street			3				1	1		1
8.1 Bennett Road Public School (walking catchment)	Colyton	Bennett Road			3			1		1		1
8.11 Barr and Bass Street Reserve (walking catchment)	Colyton	Bass Street			4	2				1		1
8.12 Gunning Park (walking catchment)	Colyton, St Marys	Marsden Road			4	2				1		1
8.13 Potter Field (walking catchment)	Colyton	Shepherd Street			4	2				1		1
8.14 Brian King Park- planting opportunities (walking catchment)	Oxley Park	Braddon Street			4	2				1		1
8.15 Oxley Park Public School (walking catchment)	Oxley Park	Adelaide Street			3			1		1		1
8.16 Oxley Park, Adelaide Street Reserve, Ridge Park, Cec Blinkhorn Oval -planting opportunities (walking catchment)	Oxley Park	Whitcroft Pl			4	2				1		1
8.17 Lucy Cobcroft Park (walking catchment)	Oxley Park	Craig Avenue			4	2				1		1
8.18 Adelaide Street between Sydney Street and Ropes Creek	St Marys	Adelaide Street			7	2		2		1	1	1

Figure 41. Precinct 8 Green Grid Strategy Matrix

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

PRECINCT 9 EAST 3

Erskine Park, St Clair



Anticipated Change:

Low level of change anticipated in these established suburbs

Urban Temperature:

Suburb recorded with high mean temperature during summer that should be targeted for reduction in urban heat island through greening; Erskine Park

Precinct Background:

Well established precinct with good access to passive parklands, natural areas, creeks and wetlands within a ten minute walking distance of homes. Erskine Park Industrial area covers a large portion of this precinct to the south.

Erskine Park and St Clair generally have power infrastructure installed as under-ground service, which provides the opportunity to deliver continuous tree canopies along roads and streets.

West District Green Grid Identified in West District Opportunity Cluster: *Refer Fig 8.

- **WD.1.5 South Creek and Ropes Creek***
- Waterway corridor - *Ropes Creek* (also in West Central District Green Grid).
- Transport corridors - *M4 Western Motorway Corridor Open Space*

Penrith Green Grid Links and Actions:

- Implement missing sections of open space along Byrnes Creek to connect to the north (across the barrier of the Great Western Highway) and to the east.
- Enhance open space connectivity to link sport, recreation and play areas throughout the Precinct and adjoining Precincts.
- Incorporate Green Grid and Cooling the City Strategy values into the industrial area

Short Term Actions and Priority Projects:

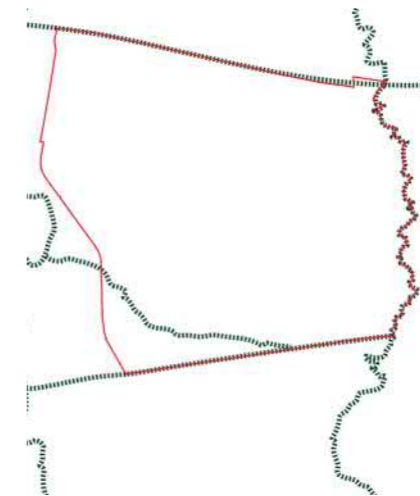
9.1 Ropes Creek recreational and hydrological corridor from Sydney Water easement to Western Motorway, reinforce pedestrian links to Ropes Creek (WDGGP).

9.14 Melville Road neighbourhood shops, car park and streetscape planting, Kindana Childrens Centre and open space planting (walking catchment).

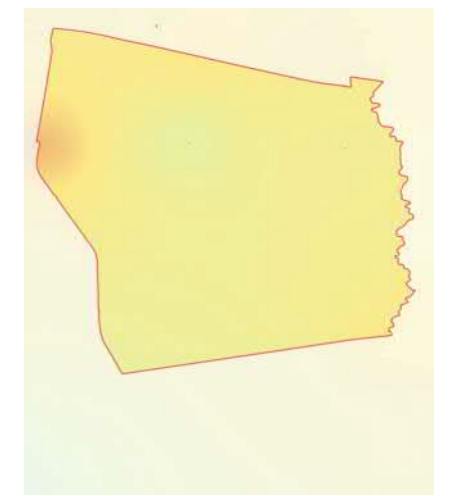
9.19 Open Space network and hydrological corridor (South Creek and tributaries), from Mamre Road, including Peter Kearns Memorial Oval to Chameleon Dr. Mamre Road shared path through Peter Kearns Memorial Oval to Banks Drive (Priority Project) connection to Precinct 11 project 11.12 across Mamre Road.



Existing Tree Canopy



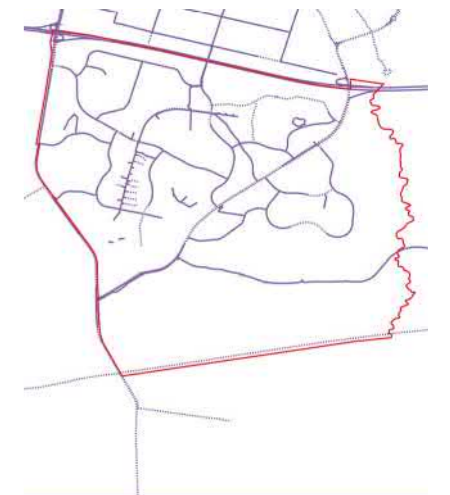
West District Green Grid



Mean Summer Air Temperature



Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 42. Precinct 9 Key Layers

Precinct 9 Matrix & Plan

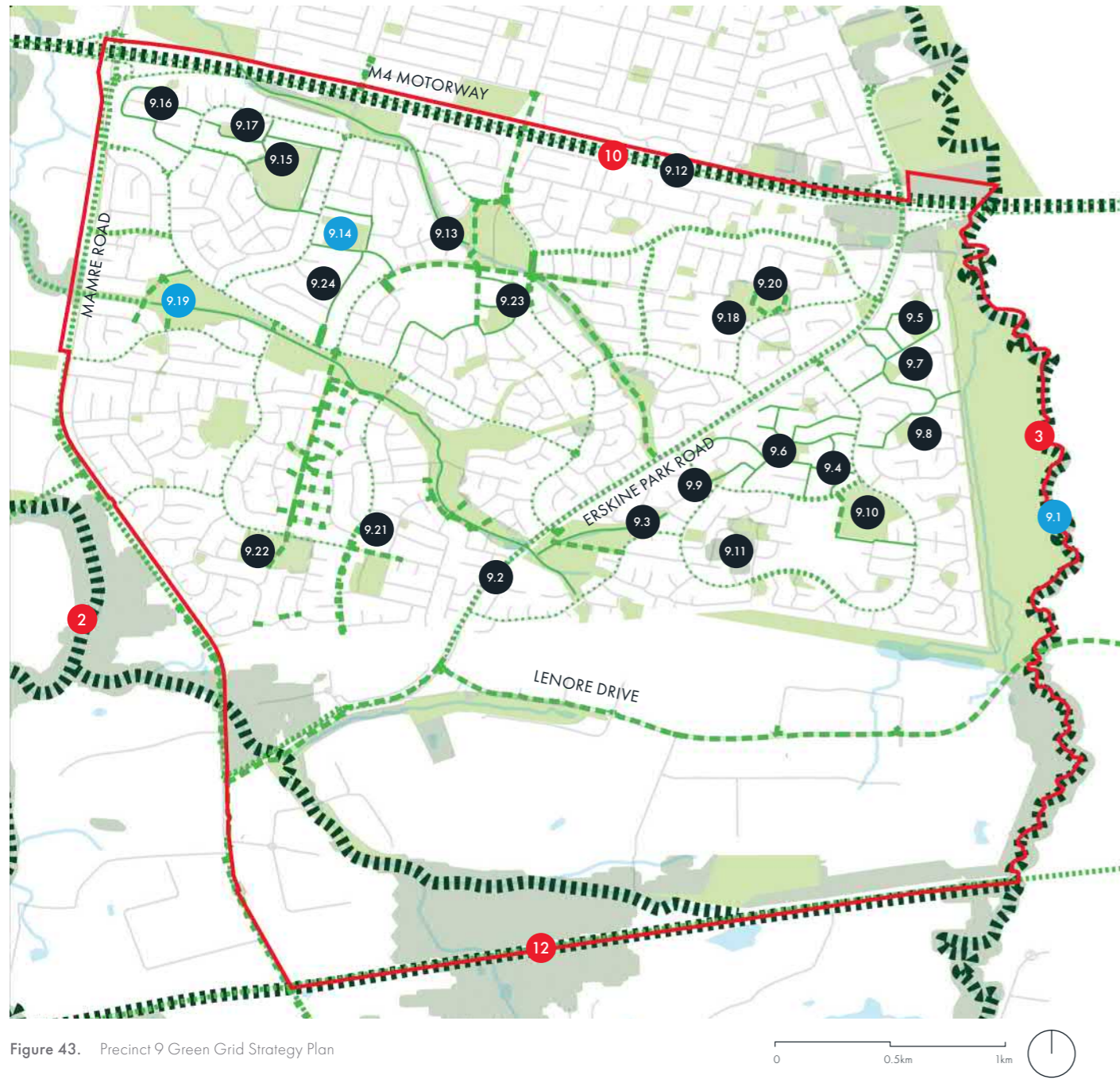


Figure 43. Precinct 9 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 2 South Creek
- 3 Ropes Creek
- 10 M4 Western Motorway Corridor Open Space
- 12 Warragamba Pipeline Open Space Corridor

KEY

- West District Green Grid
- 9.1 Priority Green Grid Project
- 9.2 Green Grid Project
- Recreation & Open Space
- Ecological land
- Waterways
- Waterbodies
- Grid Connections:**
- Existing Shared Path
- Existing On Road Cycleway
- Proposed Active Transport
- Local Green Grid



Note: Refer to matrix on following page for project scoring.

PRECINCT 9 - EAST 3

ERSKINE PARK, ST CLAIR

		Penrith Green Grid Plan Project Values						Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth Area	Urban Heat Effect Mitigation
PROJECT NAME	Suburb	Street Name	Category rating	(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)	(0-1)	(0-1)		
			West District Green Grid Project	PSRS Project	Total Value										
9.1 Ropes Creek recreational and hydrological corridor from Sydney Water easement to Western Motorway, reinforce pedestrian links to Ropes Creek (WDGGP)	Erskine Park				6	2	1	2					1		
9.2 Electrical easement Lenore Drive to Mamre Road	Erskine Park , St Clair	Lenore Drive			2	2									
9.3 Chameleon Reserve , open space and hydrological corridor from Erskine Park Road to Grebe Street	Erskine Park	Erskine Park Road			2	2									
9.4 Erskine Park Shopping Centre open space planting (walking catchment)	Erskine Park	Swallow Drive			2						1		1		
9.5 Kestral Crescent Reserve - open space planting (walking catchment)	Erskine Park	Kestral Crescent			3	2							1		
9.6 Phoenix Reserve-open space planting (walking catchment)	Erskine Park	Phoenix Crescent			4	2					1		1		
9.7 Warbler Street Corner Park - open space planting (walking catchment)	Erskine Park	Warbler Street, Whistler Cres.			4	2					1		1		
9.8 Whistler Cres. Park-open space planting (walking catchment)	Erskine Park	Whistler Cres., Fantail cres.			4	2					1		1		
9.9 Andrew Thompson Park (walking catchment)	Erskine Park	Peppertree Drive			4	2					1		1		
9.10 James Erskine Public School,Peppertree Reserve, open space planting (walking catchment)	Erskine Park	Peppertree Drive, Swallow Drive .			5	2				1	1		1		
9.11 Erskine Park Reservoir Sydney Water	Erskine Park	Canopus Cl.			2						1		1		
9.12 M4 Western Motorway- Mamre Road to Erskine Park Road	St Clair				2						1		1		
9.13 Byrnes Creek Open Space network and hydrological corridor,from Mamre Road, including Bennett & Endeavour Soccer Field to Erskine Park Road	St Clair	Buckland Road, Chateau Crescent			5	2	1	2							
9.14 Melville Road neighbourhood shops , carpark and streetscape planting, Kindana Childrens Centre and open space planting (walking catchment)	St Clair	Melville Road , Moore Street			6	2		2			1		1		
9.15 Open Space Daniel Parade open space planting(1, 2,13, 25A,7A-7E)	St Clair	Daniel Parade			2	2									
9.16 Kunipipi Street Open Space (walking catchment)	St Clair	Kunipipi Street			4	2					1		1		
9.17 Alexandra Court Open Space-open space planting (walking catchment)	St Clair	Alexandra Court			4	2					1		1		
9.18 St Clair Shopping Precinct,St Clair High School,St Clair Public School,Banks Public School (walking catchments)	St Clair	Bennett Road, Endeavour Ave.,Timesweep Dr.,Banks Drive			3					1	1		1		
9.19 Open Space network and hydrological corridor (South Creek and tributaries) , from Mamre Road , including Peter Kearns Memorial Oval to Chameleon Dr. Mamre Road shared path through Peter Kearns Memorial Oval to Banks Drive connection to Precinct 11 project 11.12 across Mamre Road.	St Clair	Mamre Road			7	2	1	2			1		1		
9.20 Clairgate Public School (walking catchment)	St Clair	Colorordo Dr.			3					1	1		1		
9.21 Martin Park (walking catchment)	St Clair	Colorordo Dr.			4	2					1		1		
9.22 Blackwell Public School, Strauss Road Open Space (walking catchments)	St Clair	Blackwell Ave.			5	2				1	1		1		
9.23 Open Space Cook Parade (11A) to Redstone Pl (97B)	St Clair	Cook Parade			3	2							1		
9.24 Holy Spirit Primary School (walking catchment)	St Clair	Todd Row			3					1	1		1		

Figure 44. Precinct 9 Green Grid Strategy Matrix

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

PRECINCT 10 CENTRAL SOUTH

Glenmore Park, Regentville



Anticipated Change:

Low level of change anticipated in the established parts of Glenmore Park. Medium level of change anticipated for the southern area of Glenmore Park where development is still being completed.

Urban Temperature: Suburb recorded with high mean temperature during summer that should be targeted for reduction in urban heat island through greening: Glenmore Park

Precinct Background:

Variety of green connections in the Precinct with passive parklands, natural areas, creeks and wetlands within a ten minute walking distance from homes.

West District Green Grid Opportunity Clusters:
*Refer Fig 8.

- **WD1.2 Nepean River, Penrith**
- **WD.1.12 Glenmore Park***
- Waterway corridors - *The Great*

River Walk: The Hawkesbury Nepean River and Nepean Creeks incl. Mulgoa Ck and Surveyors Ck.

- Transport corridors- *M4 Western Motorway Corridor Open Space and The Northern Road Green Boulevard: Badgerys Creek to Penrith.*
- Parkland corridor - *Glenmore Park Open Space Corridors.*

Penrith Green Grid Links and Actions:

- Preserve existing natural open space areas throughout Precinct.
- Improve active transport linkages and corridors to the Nepean River.
- Improve trail and creek connections throughout Glenmore Park and Regentville.
- Improve walking and cycling connections throughout Glenmore Park and Mulgoa Rise.
- Development proposals to incorporate Green Grid and Cooling the City Strategy values.

Short Term Actions and Priority Projects:

- 10.1 The Great River Walk : The Hawkesbury Nepean River (WDGGP)
- 10.4 Surveyors Creek Open Space Network and Hydrological Corridor from Western Motorway including

Surveyors Creek Softball Facility, Mulgoa Rise Fields, Blues Hills Wetland, electrical easement along Glenmore Parkway, connecting Mulgoa Nature Reserve to Blue Hills Oval Glenmore Park playground, Blue Hills Oval, Windmill Dog Park to Darug Avenue and Edgewater Drive (walking catchment)

10.5 School House Creek Open Space Network and Hydrological Corridor from Nepean River, Mulgoa Road, Glenmore Parkway including Glenmore Loch, Rotary Park and Wentworth Gardens to Ched Towns Reserve. Factory Road, Loftus Street link to River (Priority Project)

10.6 Glenmore Park Open Space Corridor from Mulgoa Nature Reserve to Blue Hills Oval, Glenmore Park Off Leash Dog Park, electrical easement East West Connection (incl. walking catchment) (WDGGP)

10.10 Ched Towns Reserve, Glenmore Park High School, Bethany Catholic Primary School, Caroline Chisholm College, Central Tree Reserve (walking catchments)

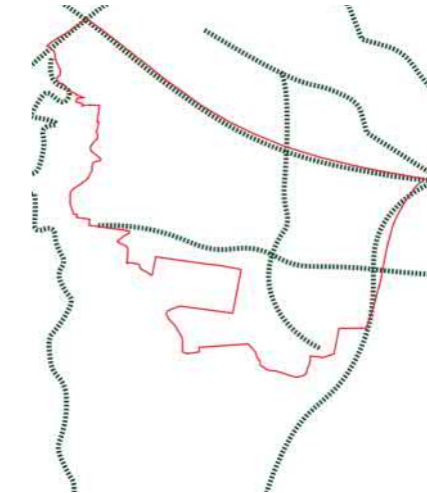
Priority Future Connections:

10.15 School House Creek from Mulgoa Road to Nepean River, within Council owned land, private property with road easement connection to Factory Road. Priority Future Connection (WDGGP)

10.16 East west connection linking Glenmore Park Open Space Corridor to Mulgoa Creek Priority future connection (WDGGP)



Existing Tree Canopy



West District Green Grid



Mean Summer Air Temperature



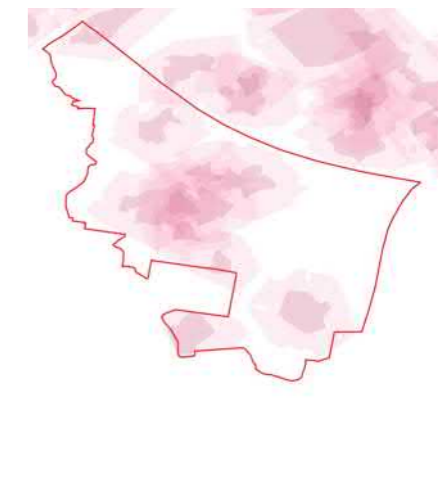
Ecology & Open Space



Active Transport Network



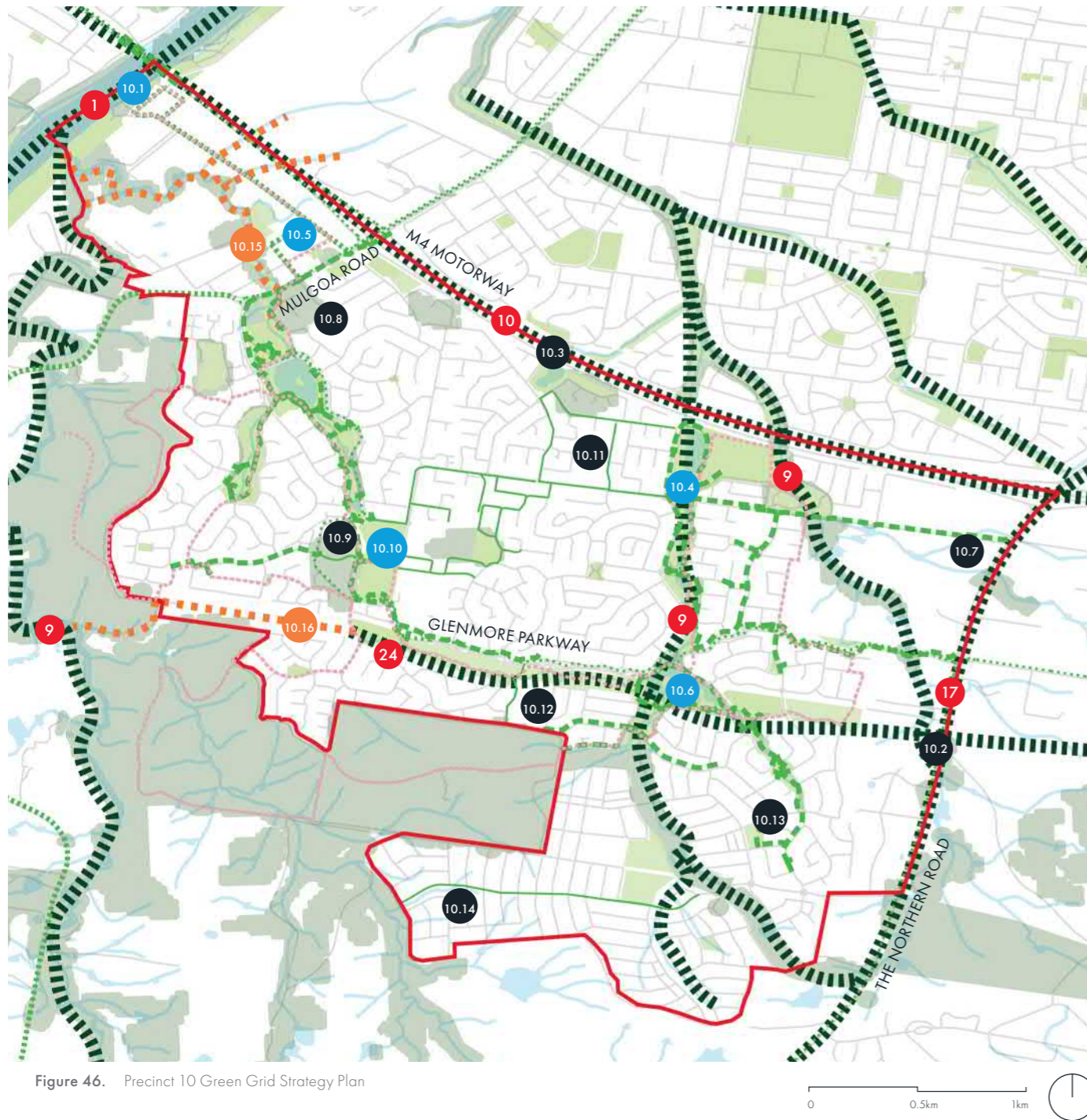
Hydrology & Flooding



Walking Catchment 400-800m

Figure 45. Precinct 10 Key Layers

Precinct 10 Matrix & Plan



WEST DISTRICT GREEN GRID PROJECTS

- 1** The Great River Walk : The Hawkesbury Nepean River
- 9** Nepean Creeks incl. Mulgoa Ck and Surveyors Ck
- 10** M4 Western Motorway Corridor Open Space
- 17** The Northern Road Green Boulevard: Badgerys Creek to Penrith
- 24** Glenmore Park Open Space Corridors

KEY

- West District Green Grid
- Priority Green Grid Project
- Green Grid Project
- Recreation & Open Space
- Ecological land
- Waterways
- Waterbodies
- Grid Connections:**
 - Existing Shared Path
 - Existing On Road Cycleway
 - Proposed Active Transport
 - Local Green Grid
 - Priority Future Connections
- Great West Walk:**
 - Main Routes
 - Local loop & links



Note: Refer to matrix on following page for project scoring.

PRECINCT 10 - CENTRAL SOUTH

GLENMORE PARK, REGENTVILLE

			Penrith Green Grid Plan Project Values													
			Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth Area	Urban Heat Effect Mitigation						
PROJECT NAME	Suburb	Street Name	Category rating	(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)	(0-1)	(0-1)	(0-1)	(0-1)	
			West District Green Grid Project	PSRS Project	Total Value											
10.1	The Great River Walk : The Hawkesbury Nepean River	Glenmore Park			6	2	1	1		1	1					
10.2	The Northern Road Green Boulevard: Badgerys Creek to Penrith	Glenmore Park	A9 The Northern Road		2	2										
10.3	M4 Western Motorway Corridor Open Space	Glenmore Park, Regentville			2					1	1					
10.4	Surveyors Creek Open Space Network and Hydrological Corridor from Western Motorway including Surveyors Creek Softball Facility, Mulgoa Rise Fields, Blues Hills Wetland, electrical easement along Glenmore Parkway, connecting Mulgoa Nature Reserve to Blue Hills Oval Glenmore Park playground, Blue Hills Oval, Windmill Dog Park to Darug Avenue and Edgewater Drive (walking catchment)	Glenmore Park	Surveyors Creek Road		8	2	1	2		1	1	1				
10.5	School House Creek Open Space Network and Hydrological Corridor from Nepean River, Mulgoa Road, Glenmore Parkway including Glenmore Loch, Rotary Park and Wentworth Gardens to Ched Towns Reserve. Factory Road, Loftus Street link to River	Glenmore Park, Regentville	Glenmore Parkway		7	2	1	2		1	1					
10.6	Glenmore Park Open Space Corridor from Mulgoa Nature Reserve to Blue Hills Oval, Glenmore Park Off Leash Dog Park, electrical easement East West Connection (incl. walking catchment)	Glenmore Park	Glenmore Parkway		7	2		2		1	1	1				
10.7	Penrith Golf and Recreation Club	Penrith	The Northern Road		4	2					1	1				
10.8	Regentville Public School (walking catchment)	Glenmore Park	School House Road		4				1	1	1	1				
10.9	Glenmore Park Town Centre Shopping Mall, car parking planting opportunity (walking catchment)	Glenmore Park	Town Terrace		3					1	1	1				
10.10	Ched Towns Reserve, Glenmore Park High School, Bethany Catholic Primary School, Caroline Chisholm College, Central Tree Reserve (walking catchments)	Glenmore Park	Town Terrace, William Howell Drive		6	2			1	1	1	1				
10.11	Glenmore Park Public School (walking catchment) to link down Lakes Drive and Kukundi Drives to Surveyors Creek Corridor	Glenmore Park	The Lakes Drive		4				1	1	1	1				
10.12	Fernhill School (walking catchment)	Glenmore Park	Ridgetop Drive		4				1	1	1	1				
10.13	Jacaranda Park (walking catchment)	Glenmore Park	Blueview Terrace		5	2				1	1	1				
10.14	Linear Park (walking catchment) Existing street trees to mature and can be supplemented.	Glenmore Park	Frontier Street, Bradley Street		5	2				1	1	1				
10.15	School House Creek from Mulgoa Road to Nepean River, shared path within Council owned land and road easement connection to Factory Road. Priority Future Connection	Regentville			8	2	1	2		1	1	1				
10.16	East west connection linking Glenmore Park Open Space Corridor to Mulgoa Creek Priority future connection	Mulgoa			8	2	1	2		1	1	1				

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

PRECINCT 11 SOUTH EAST

Orchard Hills, Luddenham, Kemps Creek, Badgerys Creek, Mount Vernon



Anticipated Change:
High level of change associated with the delivery of the Sydney Metro Western Sydney Airport, Western Sydney Airport and Aerotropolis

Urban Temperature:
Suburbs recorded with high mean temperature during summer that should be targeted for reduction in urban heat island through greening: Badgerys Creek, Orchard Hills.

Precinct Background:
Two new Sydney Metro stations are within the South East Precinct, one at Orchard Hills and one at Sydney Science Park, Luddenham for the future innovation and commercial precinct. Planning for the station precincts will occur over the next few years. *Green Grid* and *Cooling the City Strategy* values should be incorporated into planning documents.

West District Green Grid Identified in West Green Grid Cluster:
*Refer Fig 8.

- **WD.1.5 South Creek and Ropes Creek***
- Waterway corridor - Ropes Creek (also West Central District)
- Utilities easement - Warragamba Pipeline Open Space Corridor

Transport corridors include Sydney Metro (*South West Rail Link Extension*): St. Marys to Badgerys Creek, new stations at Orchard Hills and Luddenham, *M9 Outer Sydney Orbital* and *M12 Motorway Green Boulevard*. The corridor for the *Outer Sydney Orbital* goes through this precinct for which a corridor has been consulted on but not yet finalised by the NSW Government

Penrith Green Grid Links and Actions:

- Work with NSW Government to achieve Blue and Green Grid connections that incorporate active transport links.
- Ensure blue grid is maintained to contribute to ecological networks, open space and active transport links including Project 11.24 Priority future north south links across M4 to Precinct 4, along Claremont and Werrington Creeks.

- Planning and implementation of open space network that incorporates connections to South Creek and its tributaries as part of the future development of the Precinct including Blaxland Creek tributary from South Creek (WDGG)
- Development proposals to incorporate Green Grid and Cooling the City Strategy values.

Short Term Actions and Priority Projects:

- 11.3 South Creek open space and hydrological corridor from Western Motorway (future) (WDGGP)
- 11.10 Cosgroves Creek open space and hydrological corridor (WDGGP)

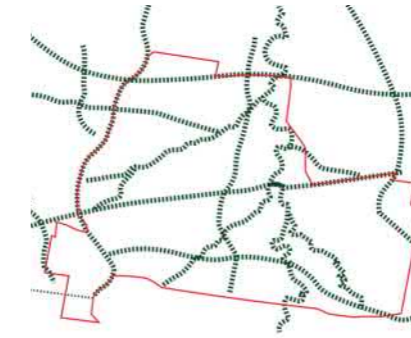
Priority Future Connections:

- 11.24 Claremont and Werrington Creeks linking to Precinct 4 - North South Links across M4. Priority future connection
- 11.25 Blaxland Creek tributary from South Creek (WDGG) Priority Future connection

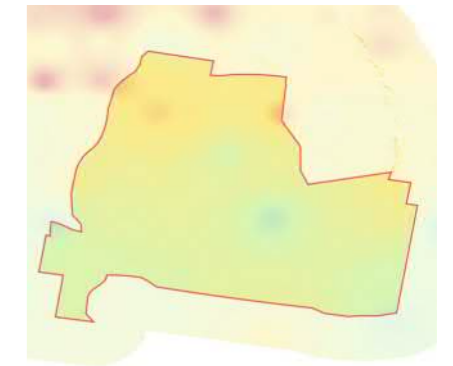


Existing Tree Canopy

5%



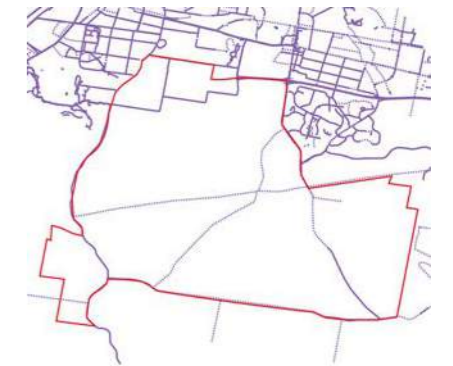
West District Green Grid



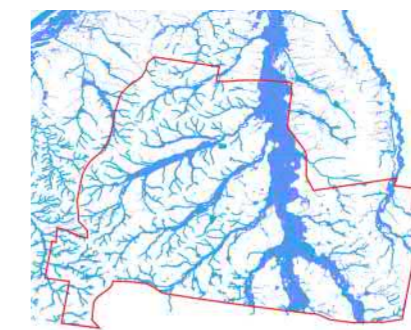
Mean Summer Air Temperature



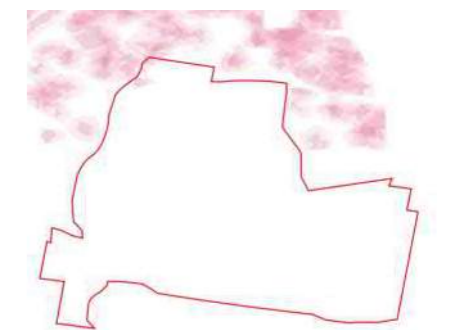
Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 48. Precinct 11 Key Layers

Precinct 11 Matrix & Plan

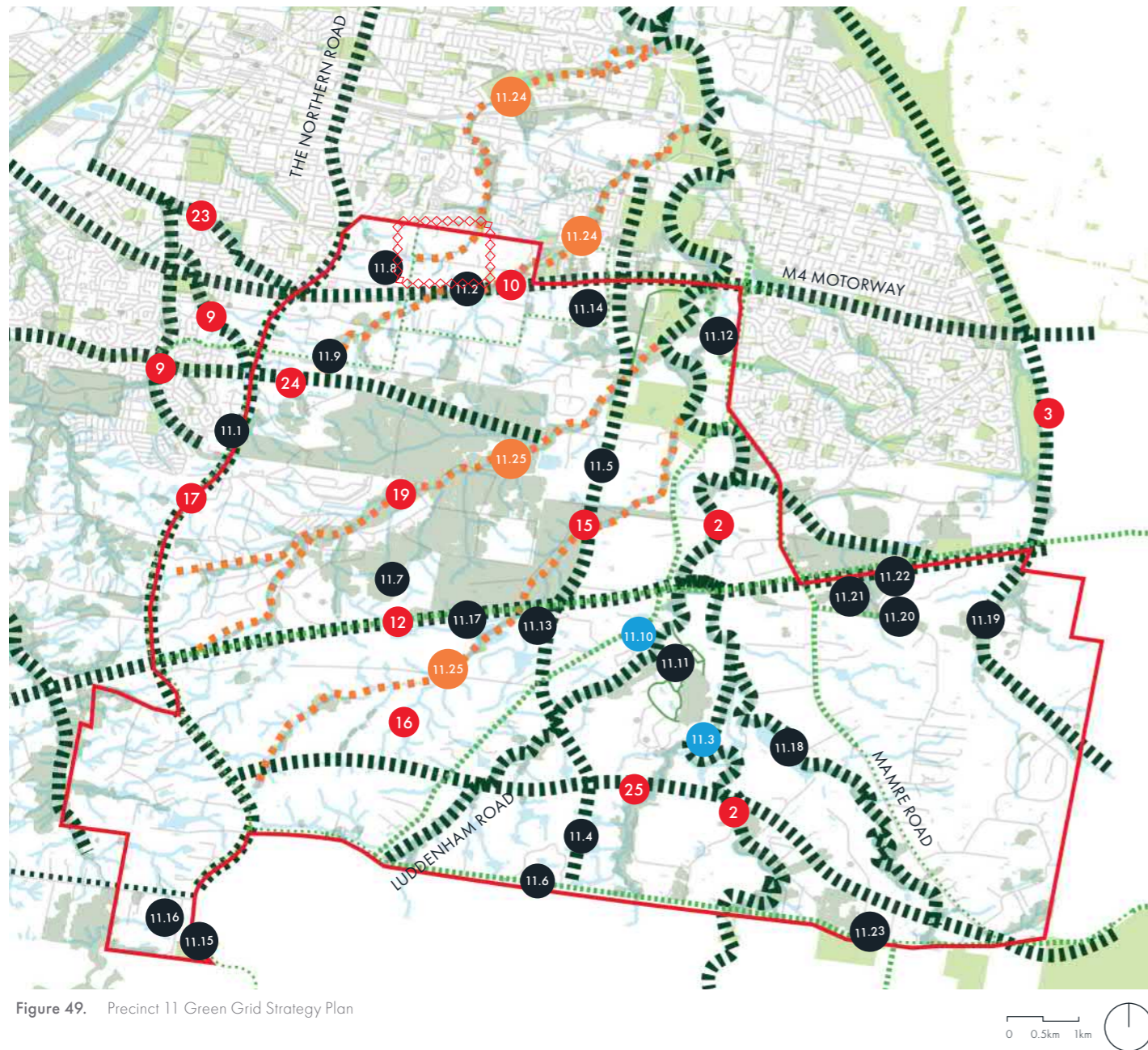


Figure 49. Precinct 11 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 2 South Creek
- 3 Ropes Creek
- 9 Nepean Creeks incl. Mulgoa Ck and Surveyors Ck
- 10 M4 Western Motorway Corridor Open Space
- 12 Warragamba Pipeline Open Space Corridor
- 15 Sydney Metro (South West Rail Link Extension): St. Marys to Badgerys Creek
- 16 M9 Outer Sydney Orbital corridor (alignment to be confirmed)
- 17 The Northern Road Green Boulevard: Badgerys Creek to Penrith
- 19 Blaxland Creek Bushland Reserve, Blaxland Creek and Crosgrove Creek
- 23 Jamison Park and South Penrith Open Space Corridors
- 24 Glenmore Park Open Space Corridors
- 25 M12 Motorway Green Boulevard

KEY

- West District Green Grid
 - 11.3 Priority Green Grid Project
 - 11.6 Green Grid Project
 - Recreation & Open Space
 - Ecological land
 - Waterways
 - Waterbodies
- Grid Connections:**
- Existing Shared Path
 - Existing On Road Cycleway
 - Proposed Active Transport
 - Local Green Grid
 - 11.24 Priority Future Connections



Note: Refer to matrix on following page for project scoring.

PRECINCT 11- SOUTH EAST

ORCHARD HILLS, LUDDENHAM, KEMPS CREEK, BADGERYS CREEK, BADGERYS CREEK, MOUNT VERNON



PROJECT NAME	Suburb	Street Name	West District Green Grid Project	PSRS Project	Category rating	Penrith Green Grid Plan Project Values								
						(0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)	
11.1	The Northern Road Green Boulevard: Badgerys Creek to Penrith	Mulgoa	A9 The Northern Road		3	2			1					
11.2	M4 Western Motorway Corridor Open Space	Orchard Hills			2							1	1	
11.3	South Creek open space and hydrological corridor from Western Motorway (future)	Orchard Hills, Luddenham, Badgerys Creek			6	2	1		2			1		
11.4	Blaxland Creek and Bushland Reserve	Orchard Hills			4	2	1					1		
11.5	Sydney Metro-Western Sydney Airport	Orchard Hills, Luddenham, Badgerys Creek			1							1		
11.6	M12 Motorway Green Boulevard	Luddenham			1							1		
11.7	M9 Outer Sydney Orbital (Alignment to be confirmed)	Orchard Hills, Luddenham, Badgerys Creek			1							1		
11.8	Orchard Hills Public School	Orchard Hills	Kingswood Road		3						1	1	1	
11.9	Penrith Anglican College	Orchard Hills	Wentworth Road		3						1	1	1	
11.10	Cosgroves Creek open space and hydrological corridor	Luddenham			6	2	1		2			1		
11.11	Twin Creeks Golf and Country Club	Luddenham			2				1			1		
11.12	Samuel Marsden Reserve , Mamre Homestead, Mamre Road link to Peter Kearns Reserve, St Clair-East West Link . (Precinct 9)	Orchard Hills	Samuel Marsden Road, Mamre Road		6	2	1	2				1		
11.13	Luddenham Road Metro Station (Sydney -Metro Western Sydney Airport) future Education, Innovation and Commercial precinct.	Luddenham			4			2				1	1	
11.14	Orchard Hills Metro Station (Sydney -Metro Western Sydney Airport)	Orchard Hills	Kent Road and Landsdown Road		4			2				1	1	
11.15	Luddenham Public School	Luddenham	Jamison Street		2							1	1	
11.16	Holy Family Catholic Primary School	Luddenham	Campbell Street		2							1	1	
11.17	Warragamba Pipeline Open Space Corridor	Luddenham, Kemps Creek			4		1		2			1		
11.18	Kemps Creek, from South Creek open space and hydrological corridor (future)	Kemps Creek			4		1		2			1		
11.19	Ropes Creek open space and hydrological corridor	Kemps Creek, Mount Vernon			4		1		2			1		
11.20	Emmaus Catholic College	Kemps Creek	Barkers Lane		2							1	1	
11.21	Mamre Anglican School	Kemps Creek	Barkers Lane		2							1	1	
11.22	Trinity Primary School	Kemps Creek	Barkers Lane		2							1	1	
11.23	Christadelphian Heritage College Sydney	Kemps Creek	Cross Street		2							1	1	
11.24	Claremont and Werrington Creeks linking to Precinct 4 - North South Links across M4.	Kingswood, Claremont Meadows			8	2	2		2			1	1	
11.25	Blaxland Creek tributary from South Creek	Orchard Hills, Luddenham			5		1		2			1	1	

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

Figure 50. Precinct 11 Green Grid Strategy Matrix

PRECINCT 12 SOUTH WEST

Mulgoa, Wallacia



Anticipated Change:

Low level of change in most of the precinct around the rural villages of Mulgoa and Wallacia. High levels of change anticipated in the north of the precinct associated with Glenmore Park Stage 3.

Precinct Background:

Wallacia and Mulgoa are small villages within the broader Mulgoa Valley.

Mulgoa Valley is known for its 'picturesque landscape with rural character. This area has been identified as a significant scenic and cultural landscape with a regional or higher level of significance (Draft Penrith Scenic and Cultural Landscape Study, Envisage Consulting, September 2019). As a result, the area within this precinct will undergo limited change'.

Fernhill Estate (412ha) has been recently purchased by the NSW

Government and will become a key component of the green grid.

West District Green Grid:

- Waterway corridors - *Nepean Creeks including Mulgoa Creek and Surveyors Creek, Blaxland Creek Bushland Reserve, Blaxland Creek and Crosgroves Creek.*
- Ecological Lands - *Mulgoa Nature Reserve*
- Utilities easement - *Warragamba Pipeline Open Space Corridor.*
- Transport corridor - *The Northern Road Green Boulevard: Badgerys Creek to Penrith*

Penrith Green Grid Links and Actions:

- Develop Great River Walk route to connect to Fernhill Estate (NSW Government).
- Work with NSW Government to achieve Blue and Green Grid connections that incorporate active transport links.
- Develop Masterplans for priority projects identified in the West District Green Grid.
- Ensure Blue grid is maintained to contribute to open space networks.
- Development proposals to incorporate Green Grid and

Cooling the City Strategy values.

Short Term Actions and Priority Projects:

12.2 The Great River Walk : The Hawkesbury Nepean River (WDGGP)

12.8 Wallacia Public School, Blaxland Crossing Reserve (walking catchments)

Priority Future Connections:

12.5 Fernhill Estate to Nepean River NSW Government

10.16 East west connection linking Glenmore Park Open Space Corridor to Mulgoa Creek Priority future connection (WDGGP)

12.9 East west connection linking the Northern Road to Nepean River Priority future connection (WDGGP)



West District Green Grid



Mean Summer Air Temperature



Ecology & Open Space



Active Transport Network



Hydrology & Flooding



Walking Catchment 400-800m

Figure 51. Precinct 12 Key Layers

Precinct 12 Matrix & Plan

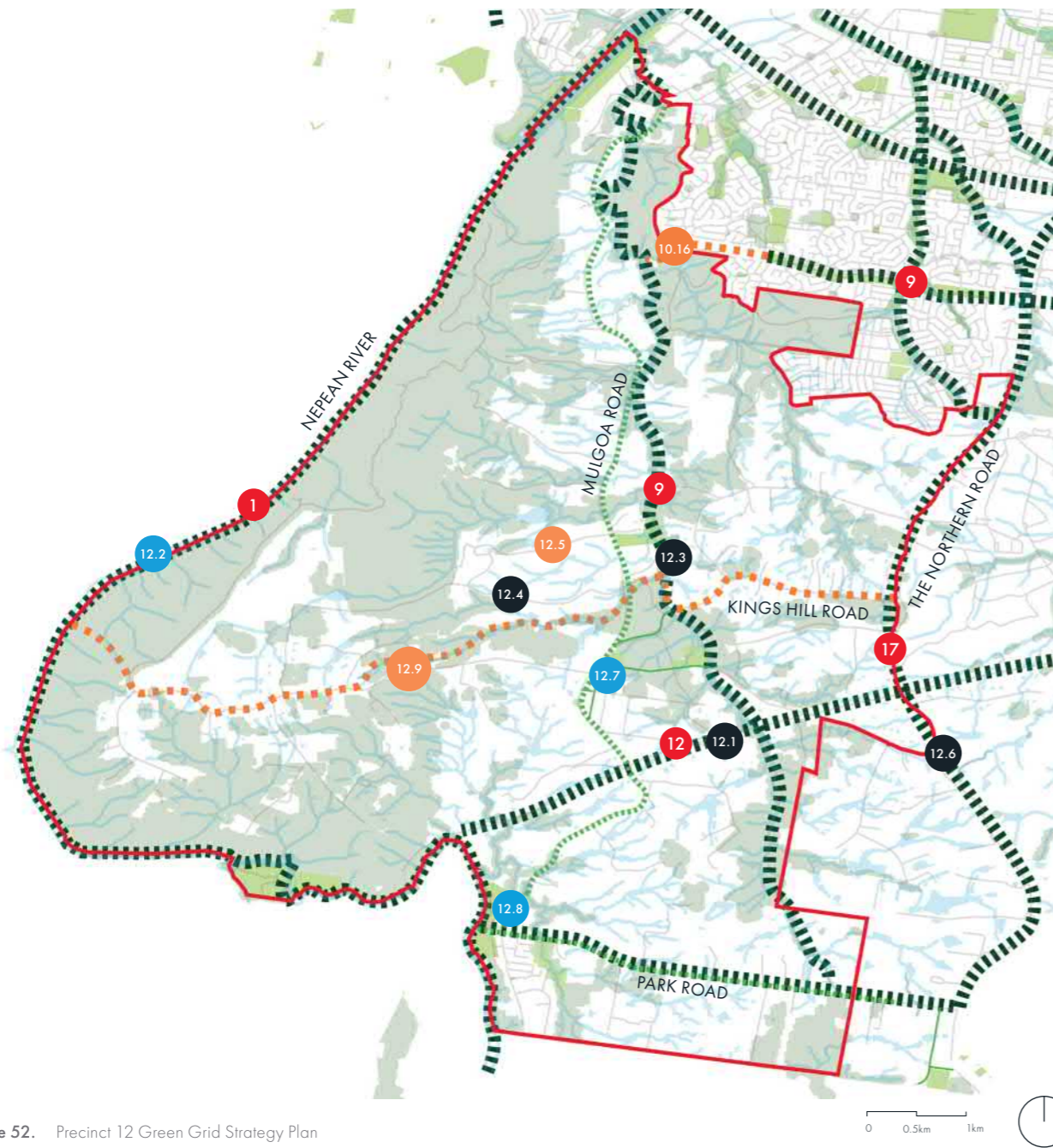


Figure 52. Precinct 12 Green Grid Strategy Plan

WEST DISTRICT GREEN GRID PROJECTS

- 1 The Great River Walk : The Hawkesbury Nepean River
- 9 Nepean Creeks incl. Mulgoa Ck and Surveyors Ck
- 12 Warragamba Pipeline Open Space Corridor
- 17 The Northern Road Green Boulevard: Badgerys Creek to Penrith

KEY

- West District Green Grid
 - 12.2 Priority Green Grid Project
 - 12.1 Green Grid Project
 - Recreation & Open Space
 - Ecological land
 - Waterways
 - Waterbodies
- Grid Connections:**
- Existing Shared Path
 - Existing On Road Cycleway
 - Proposed Active Transport
 - Local Green Grid
 - 12.9 Priority Future Connections
- Great West Walk:**
- Main Routes
 - Local loop & links



Note: Refer to matrix on following page for project scoring.

PRECINCT 12 - SOUTH WEST		MULGOA , WALLACIA									
		Penrith Green Grid Plan Project Values									
		Recreational space and connections	Riparian / Ecological corridor	Train / Metro Station connection	Active Transport Route, existing or proposed	Education/ Health Precinct Connection	Local Centre Greening or Connection	Existing Population and/or Future Growth Area	Urban Heat Effect Mitigation		
PROJECT NAME	Suburb	Street Name	Category rating (0-2)	(0-1)	(0-2)	(0-2)	(0-1)	(0-1)	(0-1)	(0-1)	
		West District Green Grid Project	PSRS Project	Total Value							
12.1	Warragamba Pipeline Open Space Corridor	Mulgoa	5	2		2				1	
12.2	The Great River Walk : The Hawkesbury Nepean River	Mulgoa	6	2	1		2			1	
12.3	Nepean Creeks:Mulgoa Creek Open Space and Hydrological corridor including Mulgoa Nature Reserve (NPWS)	Mulgoa	4	2	1					1	
12.4	Littlefields Creek open space and hydrological corridor	Mulgoa	2		1					1	
12.5	Fernhill Estate to Nepean River NSW Government (including Blue Mountains National Park)	Mulgoa	Mulgoa Road	3	2	1					
12.6	The Northern Road Green Boulevard: Badgerys Creek to Penrith	Mulgoa	A9 The Northern Road	2	2						
12.7	Mulgoa Shopping Centre, Mulgoa Public School (walking catchment)	Mulgoa	Mulgoa Road	6	1	1		1	1	1	
12.8	Wallacia Public School, Blaxland Crossing Reserve (walking catchments)	Wallacia	Mulgoa Road	6	2			1	1	1	
10.16	East west connection linking Glenmore Park Open Space Corridor to Mulgoa Creek	Mulgoa		5	2	1		2			
12.9	East west connection linking the Northern Road to Nepean River	Mulgoa		5	2	1		2			

Figure 53. Precinct 12 Green Grid Strategy Matrix

Note: Refer to Section 6.1 and 6.2 on pages 45-46 for an explanation of the matrix. Priority projects are those that score a total value of 6 or more.

7.2 Delivery Processes

Priority 1 Leading Change and Championing the Green Grid

Outcome Interdepartmental cooperation implements and maintains the Green Grid

Priority 2 Funding Penrith's Green Grid

Outcome By 2041, Green Grid short-term actions and priority projects are implemented through ongoing revenue streams

Priority 3 Integrating Community Desires with Green Grid initiatives

Outcome Green Grid projects respond to local community needs and aspirations and facilitate community buy in

Priority 4 Valuing Green Infrastructure as an Asset

Outcome By 2031, Green Infrastructure is an asset class within Council's asset management system

Priority 5 Developing the Blue Grid as part of the Green Infrastructure

Outcome Water in the landscape is retained and managed

Priority 6 Moving from Intention to Results

Outcome City of Penrith has high quality, diverse, ecologically responsive and connected green infrastructure

Council's Integrated Planning and Reporting (IP&R) framework under the Local Government Act 1993 provides the basis for implementation of the Green Grid Strategy. Under the IP&R framework, Council is required to prepare a number of plans including the Community Strategic Plan, a Delivery Program and an Operational Plan to outline planned work and track our progress on the commitments we made to achieve our community's vision for Penrith.

Implementation of the Green Grid Strategy will be considered in the development of Council's next Community Strategic Plan and Delivery Program. This will allow a coordinated approach to the implementation of the strategy to achieve the greatest benefit for the community.

Council reports on its performance through the IP&R framework with twice a year reports on progress towards our 4 year Delivery Program and four times a year on progress towards our current Operational Plan.

We've developed indicators to measure progress towards the outcomes our community wants to achieve and we use performance measures to track our success in achieving what we set out to do within the Delivery Program. The actions set out below will be included within our Delivery Program and Operational Plan to ensure we track and measure our delivery of the Green Grid Strategy.

Actions

Existing Council strategies and plans provide the policy framework for the Green Grid Strategy and its implementation needs to be considered in the context of what already exists.

To this end, the actions included in Council's Local Strategic Planning Statement and the Resilient Penrith Action Plan support the implementation of the Green Grid Strategy. However, specific actions have been developed for the Green Grid Strategy that will deliver the priorities and outcomes identified in the Green Grid Strategy and build on actions already in place.

These actions are included in a table against the six priorities in the following sections of the implementation plan

The actions include the following:

- **Parent Action**

The action that is already included in an endorsed Council document such as the Local Strategic Planning Statement or the Resilient Penrith Action Plan, where relevant.

- **Action**

The action that Council will undertake to implement the Green Grid Strategy over time.

- **Timeframe**

Actions have been prioritised into high, medium, low and ongoing to be completed over the lifetime of the Strategy. Priorities should be periodically reviewed and reassessed in line with available budgets, resources and funding opportunities. The timeframe for completing prioritised actions is:

Short - Action to occur over the next 1-2 years in the first half of the current Delivery Program

Medium - Action to occur over the next 2-4 years in the second half of the current Delivery Program

Long - Action to occur during subsequent delivery program 5+ years

Ongoing - Action to be undertaken on an ongoing basis

- **Council's Role**

Plan - implementing strategic planning responsibilities

Advocate - representing community needs and interests to Commonwealth and State Governments and the private sector

Collaborate - working closely with businesses, industry, developers, investors, government department and agencies and peak bodies

Deliver - coordinating delivery of works on the ground

Regulate/monitor - ensuring that future works respond to relevant regulations and expectations

7.3 PRIORITY 1 Leading Change & Championing the Green Grid

Outcome

Interdepartmental cooperation implements and maintains the Green Grid

Penrith's Green Grid is dynamic and must be strategically planned for, invested in and managed at local and regional levels to reach a sustainable future.

An in-depth understanding of the role of green infrastructure and the need for co-ordination and co-operation across political and administrative boundaries is essential. The following recommended actions will guide the implementation of the Strategy.

- Adopt Penrith's Green Grid Strategy as a Councillor Priority.
- Build Council's culture around integrating the Strategy as a key purpose.
- Integrate Green Infrastructure within relevant Plans.
- Integrate State and Council Plans.
- Undertake planning and operational changes to ensure the Strategy is successfully executed.
- Integrate Green Infrastructure within all (relevant) Council projects – integration between planning and delivery.
- Short term goals - target achievable outcomes.
- Mid to long term outcomes - ensure area wide Green Grid linkages are achieved.

A top down approach needs to be supported by bottom up culture that is driven by a common purpose that also embraces community values.

Interdepartmental Cooperation to refine policy and guidelines

Planning the Green Grid requires urban design, emerging development, infrastructure construction, environmental protection and other aspects to be considered as a whole system (Green Infrastructure). A comprehensively integrated outcome for Penrith will require internal governance where strategic planning will bring social environmental and economic perspectives to guide the Green Grid.

Through multidisciplinary cooperation across Penrith Council's departments including City Futures, City Services, and Development and Regulatory Services can policy be redefined for the Green Grid

Interdisciplinary collaboration should be undertaken to maximise advantages and identify ways around constraints to ultimately inform Council Policy.

Green Infrastructure on private land

Green Grid Infrastructure includes private lands or lands not in Council ownership. State Government provides the policy framework for development planning, and that the current planning reforms underway will provide an opportunity to embed Green Infrastructure. Working with the Department of Planning Industry and Environment (DPIE) and Transport for New South Wales (TfNSW) on the policy planning is an opportunity for the LGA.

Champion the Green Grid

Consideration is required by Council as to the most effective way to drive the implementation of Green Grid strategies.

It will be necessary to promote a consistent approach to the implementation, balancing the often competing aspects of future developments. Incorporation of Green Grid Strategy into Council Plans and Policies will ensure these are embedded into Council documentation and goals, however pathways must be found for State government departments to support and assist with prioritising Green Grid when considering future projects.

to be realised. Interdisciplinary collaboration should be undertaken to maximise advantages and identify ways around constraints to ultimately inform Council Policy.

An open dynamic implementation strategy to monitor "success" and encourage development of 'lessons learnt' to improve processes and outcomes will inform the development of the Strategy.

Ultimately, the Green Grid Purpose and how it is being achieved must be exemplified in both quantitative and qualitative terms

Interdepartmental cooperation will lead to changes that reinforce the values and outcomes identified in the Strategy and will guide amendments in planning objectives and controls that drive Green Grid outcomes such as Development Control Plans and development guidelines.



Parent Action	Action	Timeframe	Council's Role
Priority 1: Leading Change & Championing the Green Grid			
Outcome 1: Interdepartmental cooperation implements and maintains the Green Grid			
	Action 1.1 Actively monitor the success of the Green Grid Strategy by monitoring change in tree canopy annually.	Ongoing	Plan Monitor
	Action 1.2 Establish a cross Council working group for the first two years of implementation to build knowledge and capacity in the organisation	Short	Monitor Collaborate



7.4 PRIORITY 2 Funding Penrith's Green Grid

Outcome

By 2041, Green Grid short-term actions and priority projects are implemented through ongoing revenue streams

Accessing and aligning with funding sources needs to be matched with capabilities to implement and sustain the Green Grid. Funding may be sourced from State or Federal government, Council environmental levies and capital works, Voluntary Planning Agreements (VPA), private and organisation dedications and grants, conservation agreements, planning agreements, levies raised under the Special Infrastructure Contributions program, community title schemes, biodiversity offsets and conditions of consent.

Grants can be allocated to the community, Council and organisations to conduct green infrastructure programs such as water way rehabilitation, removal of exotic vegetation, naturalisation of waterways and managing urban bushland.

There is the opportunity for value capture from private landowners from Public infrastructure investment through the LGA that can be directed to the implementation of the Green Grid.

Penrith Council Local Funding

Council can start with common practices within current budgets and work programs (e.g. street tree planting) and align actions with priority projects that have been identified in the Strategy.

Green Grid opportunities can be divided into small quick win projects that can be implemented in the short term and complex longer term initiatives where significant funding is required.

Planning for complex projects should commence to ensure implementation goals over an extended period are achieved, particularly given the size of Penrith LGA. However there are on-going benefits to implement smaller projects as funding becomes available to incrementally grow the Green Grid network and maximise physical benefits for all.

To promote the conversation around the Green Grid, it is important to focus on areas where an immediate impact within the City can be made, while at the same time investigating external funding opportunities to implement major projects.

There is also an opportunity for Penrith to use cross-boundary VPAs to maximise the benefits and leverage economies of scale of green infrastructure through sub-regional delivery.

NSW Government funding

Opportunities for economies of scale from delivering green infrastructure at regional scale needs to be incorporated into grid initiatives. To achieve Western Parkland City outcomes, grid connectivity with the adjoining Council areas of Blacktown, Liverpool, Hawkesbury and Blue Mountains is essential.

Implementation of the Strategy to maximize co-benefits will open up funding sources through connecting to government strategy and capital allocation decisions.

For example, funds for infrastructure and place making, open space and wildlife conservation, or disaster relief can go towards funding the Green Grid. In addition, Council can consider innovative financing strategies to capture the economic value created by flood costs avoided, increased health benefits, or increased property values.

Council can aggregate multiple funding and revenue sources, or combine a funding source with financing options such as low-interest loans or green bonds.

Council should investigate grants that support urban heat island reduction, green infrastructure, active transport and community and stakeholder collaboration.

State funding sources include:

- Special infrastructure contributions
- State Voluntary Planning Agreements (SVPA)
- Housing Acceleration Fund
- Local Infrastructure Growth Scheme

- Metropolitan Greenspace Program - Precinct support scheme
- General revenue funding for green infrastructure from agencies such as NSW Health and Transport for NSW
- Sydney Water –community grants
- Walking and Cycling Grants associated with local road improvements, delivery of metropolitan cycle networks , projects aligned with Future Transport Strategy 2056, pop –up bike lane programs.

Prioritise the sourcing of an ongoing revenue stream for adequately resourcing to protect & maintain the health & viability of all Green Grid infrastructure

- Greening Our City grant
- Streets as Shared Places for People
- Your High Street Guideline
- Tench Reserve: Parks for People (Strategic Open Space Program)

Parent Action	Action	Timeframe	Council's Role
Priority 2: Funding Penrith's Green Grid			
Outcome 2: By 2041, Green Grid short-term actions and priority projects are implemented through ongoing revenue streams			
Develop and undertake tree planting projects across Penrith, including suburbs with a high heat vulnerability index (Resilient Penrith Action Plan)	Action 2.1 Include detailed design and construction of short-term actions and priority projects in Council's Delivery Programs	Short - long	Plan Deliver
	Action 2.2 Seek out and apply for relevant State funding opportunities to develop and deliver the short-term actions and priority projects in the Green Grid Strategy	Short - long	Collaborate
	Action 2.3 Negotiate Voluntary Planning Agreements to implement short-term actions and priority projects as part of Planning Proposals	Ongoing	Deliver

The Strategy should be incorporated into an inclusive community planning process



7.5 PRIORITY 3 Integrating community desires with Green Grid initiatives

Outcome

Green Grid projects respond to local community needs and aspirations and facilitate community buy in.

The Strategy should be incorporated into an inclusive community planning process. The priority projects are within streets and neighbourhoods and present an opportunity to integrate community desires with Green Grid initiatives

The Strategy provides essential services for people; and therefore must respond to local community needs and aspirations, as well as contribute towards the provision of ecosystems.

It is important that pilot project sites are developed or promoted through this Strategy to highlight the experiences of working with communities and the challenges and opportunities created through partnerships as well as the technical aspects of planning Penrith's Green Grid.

The role of the community as custodians of the implemented outcomes will provide the ongoing monitoring and ownership to ensure a successful Green Grid. This Strategy will be placed on public exhibition for on-going community engagement.

Parent Action	Action	Timeframe	Council's Role
Priority 3: Integrating community desires with Green Grid initiatives			
Outcome 3: Green Grid projects respond to local community needs and aspirations and facilitate community buy in			
	Action 3.1 Implement Council's Community Engagement Strategy in the delivery of green grid projects	Ongoing	Deliver

7.6 PRIORITY 4 Valuing Green Infrastructure as an Asset

Outcome

By 2031, Green Infrastructure is an asset class within Council's asset management system.

Penrith's local environment is critical to sustainable economic prosperity by contributing to growth, economic security and the provision of healthy ecosystems. Green infrastructure can mitigate and alleviate the effects of climate change and pollution, reduce the impacts of flooding, improve public health and create places for people

Economic valuation is a critical element for effective green infrastructure delivery to measure:

1. Direct benefits (e.g. jobs created, tourism spend)
2. Indirect benefits (e.g. economic activity in green infrastructure supply chain industries)
3. Cost reduction (e.g. lower disaster recovery and health system costs)
4. Risk management (e.g. reduced insurance premiums for homes and business)

The Green Grid can be recorded as GIS data in line with Strategy Grid Maps as green infrastructure is implemented. Potential spatial attributes that can be recorded include species, risk mitigation and issues management data.

Green infrastructure can mitigate and alleviate the effects of climate change and pollution, reduce the impacts of flooding, improve public health and create places for people

Common GIS and spatial data including root spread versus canopy (different species have different root systems), and proximity to other surface and buried assets could be used.

The GIS register could link works and management to Council's Customer Information System to include tree preservation orders, requests for removal, reduction etc. Ultimately the register can be included within Council's main asset register system.

Holding a value against the Green Grid will allow forecasting of capital expenditure, annual depreciation and maintenance expenditure vs. replacement cost to assist in budgeting for intervention levels. As an asset class, Council can measure the financial impact on the community if green infrastructure is destroyed or not implemented.

Parent Action	Action	Timeframe	Council's Role
Priority 4: Valuing Green Infrastructure as an Asset			
Outcome 4: By 2031, Green Infrastructure is an asset class within Council's asset management system			
	Action 4.1 Prepare a tree inventory and integrate it with Council's Asset Management System	Short	Plan
	Action 4.2 Prepare an economic valuation for green infrastructure using the NSW Government's sector-specific framework for valuing green infrastructure and public spaces	Medium	Plan

7.7 PRIORITY 5 Developing the Blue Grid as part of the Green Infrastructure

Outcome

Water in the landscape is retained and managed

The development of the Green Grid is interlinked with a healthy Blue Grid. This Strategy has investigated and considered the Green and Blue grid together. Future development of projects should be holistic, and on-going with this approach. Retaining more water in the landscape, through the creation of wetlands, harvesting runoff for irrigating the urban tree canopy will assist in the mitigation of the urban heat island effect and improve biodiversity.

The main drainage overland flow reserves which form and feed the key waterway corridors

identified in the West Grid should be reviewed to improve the quality of stormwater runoff. Penrith's Local Strategic Planning Statement identifies Planning Priority 16: Protect and Enhance Our High Value Environmental Lands as an immediate action to collaborate with Infrastructure NSW and other State agencies for South Creek.

Creeks and tributaries need to be protected and integrated into a connected network that responds to catchment-based flood management utilizing 'natural' treatments that provide ecological protection and enhancement including:

- Retention and management of water in the landscape: retain water through management of infiltration and overland flow, flood amelioration, bioretention, and water sensitive urban design
- Improving and increasing space for water: bioremediation of creek systems for conveyance, water quality and storage

- Multifunctional water in the landscape: creation of ecological biodiverse connections which also link to open space networks.

Council has undertaken preliminary investigations into sustainable water management in the *Penrith Lake Upper Catchment Physical Profile and Action Plan AECOM 2013*. The document identifies opportunities to improve the quality of stormwater runoff within the Penrith Lakes Upper Catchment. Seven high priority wetland sites were identified as water quality improvement opportunities and located in Precinct 2 Central North – Cranebrook.

Works have already been undertaken for two of the identified wetlands. The remaining projects could be further progressed to design stage noting that the project scopes and cost estimates will need to be updated based on the lessons learnt in the implementation of the two wetland projects to date



In particular, a unique 'sense of place' derived from Penrith's many waterways will create more sustainable communities.

Penrith's many waterways will create more sustainable communities.

WSUD will also create opportunities around waterways that will deliver low risk and better return on investment for land developers on both greenfield and brownfield developments.

Of particular importance is the reduction of impervious surfaces to assist in mitigating impacts and aligning with urban heat mitigation. The reduction in impervious surfaces within existing and proposed development will improve opportunities for rainfall to be attenuated within vegetation and soils and for the provision of water to establish the Green Grid.

The development of the Blue Grid should consider the design and management of a green Infrastructure approach, starting with a water-led approach to planning as identified in *Urban Typologies and Stormwater Management-achieving a cool, green, liveable Western Parkland City*

Sydney Water, Bligh Tanner, Architectus 2020

Water Sensitive Urban Design (WSUD)

WSUD considers stormwater management in parallel with the ecology of a site, best practice urban design, and community values.

For Penrith, facing challenges with extreme temperatures, WSUD will ensure multiple public benefits from stormwater management that will recharge living systems and support the implementation of the Green Grid.

Retaining more water in the landscape through WSUD best practice, will help to mitigate the urban heat island effect and manage flows of stormwater. In particular, a unique 'sense of place' derived from

Parent Action	Action	Timeframe	Council's Role
Priority 5: Developing the Blue Grid as part of Green Infrastructure			
Outcome 5: Water in the landscape is retained and managed			
Identify opportunities to implement water sensitive urban design on public and private land, including opportunities to better integrate water infrastructure and green infrastructure (LSPS)	Action 5.1 Integrate best-practice water sensitive urban design initiatives and use of recycled water into the design and delivery of short-term actions and priority projects	Ongoing	Plan Collaborate Deliver
Application of water sensitive urban design and naturalisation projects (Resilient Penrith Action Plan)	Action 5.2 Develop a Green Infrastructure Master Plan for the centres of Penrith, Kingswood, Werrington, St Marys and Orchard Hills	Medium	Plan

7.8 PRIORITY 6 Moving from Intention to Results

Outcome

City of Penrith has high quality, diverse, ecologically responsive and connected green infrastructure

Urban Growth - Integrated Planning Opportunity for Change

Penrith's planned growth can demonstrate how access to high quality, diverse and connected green space can be achieved. Specific areas that can be addressed include understanding time frames, the role of transport infrastructure, implementation issues and early opportunities to demonstrate Green Grid initiatives.

Time for Planning Implementation and Monitoring

The Green Grid is a series of interconnected elements and the ecological interventions associated with green infrastructure are complex. The nature of green infrastructure is that it will change over time so isolated interventions will not produce long-term effects. Staged interventions, regular monitoring and maintenance should be undertaken to allow for the evolution of the grid to maturity.

New street side planting will require local understanding of issues and mitigation processes. Street planting opportunities and constraints needs to be factored into future

streets and roads. To achieve 40% tree coverage, private lands will require space for canopy cover, i.e. generous building setbacks and verges, lower percentage cover of built form on residential blocks, in conjunction with minimizing road pavements.

The new population that will be housed in existing and growing suburbs provides an opportunity to fully integrate Penrith's Green Grid Strategy starting with refining subdivision and urban design layout models that prioritise the following:

Open space access:

Investigate opportunities to ensure all residential areas are within 400 metres of open space and all high density residential areas (over 60 dwellings per hectare) are within 200 metres of open space. Align parks, open space and waterway projects.

New Neighbourhoods:

Plan new neighbourhoods with a sufficient quantity and quality of new open space and minimum hard surfaces. Setbacks and private open space provisions to support canopy cover

Sharing space:

Deliver shared and co-located sports and recreational facilities including shared school grounds and re purposed golf courses.

Connectivity:

Provide walking and cycling links to transport, key destinations, sports and recreational open space and

Staged interventions, regular monitoring and maintenance should be undertaken to allow for the evolution of the grid to maturity.

waterways.

Protect and enhance:

Urban bushland areas and waterways of high environmental value on public land need to be protected, managed and considered for incorporation into the planning and design of new neighbourhoods to maximise urban tree canopy.

Riparian Corridors:

Penrith's challenge is the fragmentation of ownership of these. Encourage a coordinated approach to have public ownership of riparian corridors to achieve positive outcomes for biodiversity and waterway health.

Water Sensitive urban Design:

Apply water sensitive urban design principles where appropriate.

Highways, Roads and Streets

The road network contributes to the urban heat island effect in Penrith. The reduction in hard paved non permeable surfaces and increase in planting would assist in reducing overall temperatures. Changing the adopted standards for road and lane widths should be considered in conjunction with lowering speed limits and prioritising walking, cycling and public transport over cars within neighbourhood zones.

Many existing shared paths do not have tree coverage or space for trees, therefore contributing to urban heat and making these routes uninviting for walking and recreational purposes. Routes need to connect.

Ultimately, with the growth in population, the shared paths will not function for commuter cyclists. A network of on road separated paths should be planned and implemented in conjunction with the planting of a continuous tree cover. These can be retrofitted within streets by narrowing the lane markings and slowing speeds.

Areas of focus to include the following:

At grade car parking: Introduce trees to existing car park areas and all new car parks if they cannot be accommodated within built structures should have a minimum of 40% tree canopy cover with the minimisation of paved surfaces or the use of permeable surfaces. Tree growing beds need to be of a scale to allow trees to reach maturity.

On street parking: Reconcile the needs for on road parking spaces where there are existing driveways and garaging to allow the conversion of portions of on road pavement to tree planting islands that can be passively watered through the installation of castellated kerbs

Slowing speed: Narrowing street entry points to prioritise pedestrians and for planting to improve pedestrian connectivity across roads and streets by shorting crossing distances.

Aligning with active transport links: Utilise existing road pavements for separated at grade cycle links with continuous tree canopies within verges. All shared paths are to have tree cover to meet Green Grid outcomes. The Penrith Accessible Trails Hierarchy Strategy should be reviewed and updated.

Overhead infrastructure:

Continue to advocate for the undergrounding of overhead infrastructure in new developments. Underground overhead powerlines in key locations and new urban centres at Penrith, St Marys, Kingswood, Werrington, Orchard Hills and Luddenham Road Metro Station. Where overhead powerlines are to be retained, review option to plant trees within road pavement zones (kerbside parking or median) and select suitable species to install under powerlines to create continuous canopies.

Underground infrastructure:

Advocate for the bundling and co-sharing of in ground utilities in common easements within verges to allow sufficient space for street trees.

New Developments: Rethink road layouts and widths, limit areas of hard surfaces (including on private land) in new developments to an absolute minimum. Share single entry driveways and minimise paving to garaging.

End of Trip Facilities: Advocate for the inclusion of end of trip facilities for cyclists within new developments to encourage use of Active Transport Network.



Arterial Roads - Transport for New South Wales (TfNSW):

Highway corridors with walking and cycling connections should be planned in conjunction with TfNSW to ensure connectivity to local routes. Green Infrastructure should be integrated into the planning of these routes due to the width of the corridors and extensive urban heat generating pavements.

Proposed infrastructure in lands under development should incorporate generous verges for the inclusion of shared paths and continuous tree canopies. Passive watering strategies along these routes should also be incorporated into the design of these networks. Grade separated pedestrian connections are not preferred due to the additional walking distance for local pedestrians.

Speed in urban areas should be lowered as the population increases. Where possible and speed limits permit, trees should be planted closer to kerb alignments to shade road pavements.

Advocacy for implementation at all levels of government.

Support from State Government departments will be expected to assist with championing the implementation of Green Grid projects, and support delivery of Premier's Priorities through advocacy for implementing and prioritising Green Grid strategies.

Street Tree Planting

The broad and varied nature of the topography of the Penrith LGA requires a detailed understanding of the environments that the grid is expected to perform under.

Existing street tree planting reflects extremely tough growing conditions as many trees are stunted or growing at incredibly low rates. A detailed review of existing practices to assist in species selection, ground preparation, installation, ongoing maintenance, local conditions and an understanding on what is stressing plant stock needs to be considered before planting. This needs to occur for each project as conditions vary across the LGA.

On planned estates such as Waterside in Cranebrook and sections of Glenmore Park, trees are healthier as there has been space allowance and ground conditions were improved or generally better to support tree growth. Many planned estates within the LGA have street trees which have performed poorly and unlikely to reach expected maturity size. Ground conditions, mowing practices and lack of mulch rings may be impacting tree growth and spraying grass beneath trees.

Council's *Street and Park Tree Management Plan (S&PTMP)* is a comprehensive guide on the parameters for tree planting and management. All new planting should follow the actions as identified in the S&PTMP.

Additional recommendations with a focus on maximising continuous tree canopies to assist in the mitigation of heat include:

1. Understanding the local environment's influence on achieving maximum tree size.
2. Develop Tree Species Matrix of successful species in consultation with Aboriginal and Torres Strait Islander people.
3. Tree selections to reflect site understanding and be informed by existing vegetation communities and successful species.
4. Planting of trees closer than usual to achieve a continuous canopy within a reasonable time frame (5 years)
5. Plan for tree stock availability to ensure suitable size and acclimatisation for installation.
6. Ensure developers are installing and maintaining tree stock to Council's requirements. Enforce replacement in conjunction with in ground improvements if trees are not performing at the 2 year mark.
7. Replace poorly performing existing street trees.
8. Interplant within existing street trees to create continuous canopies
9. Replace grassed areas with suitable planting and mulches beds to create ecological corridors and to reduce mowing.
10. Implement target setting for canopy cover through new planting including; street trees, open space areas and private

The Strategy can be demonstrated very early on with constructed pilot projects ensuring robust design review to ensure effective treatment and maintenance.

land.

11. Higher focus on tree establishment and ongoing watering, monitoring and mulching for 5-10 years to maturation
12. Retrofit harsh landscapes such as carparks.
13. Funding to monitor and maintain, to track progress and refine work method

Pilot Projects

The Strategy can be demonstrated very early on with constructed pilot projects ensuring robust design review to ensure effective treatment and maintenance. These projects can also demonstrate the Grid is aligned with community well-being, through the creation of a healthy environment by focusing on a location with a higher population density.

Pop Up Projects

Active transport connections can be tested through installing temporary infrastructure along proposed on road separated cycle routes. The projects will allow the community to make the adjustments in access and circulation and utilize the route to understand Councils cycling strategy.

Monitoring, Assessing and showing evidence of progress

Investigate the application of new digital technologies that can help automate the process of collecting, reporting and visualising data about the condition of the green grid for monitoring, maintenance and project

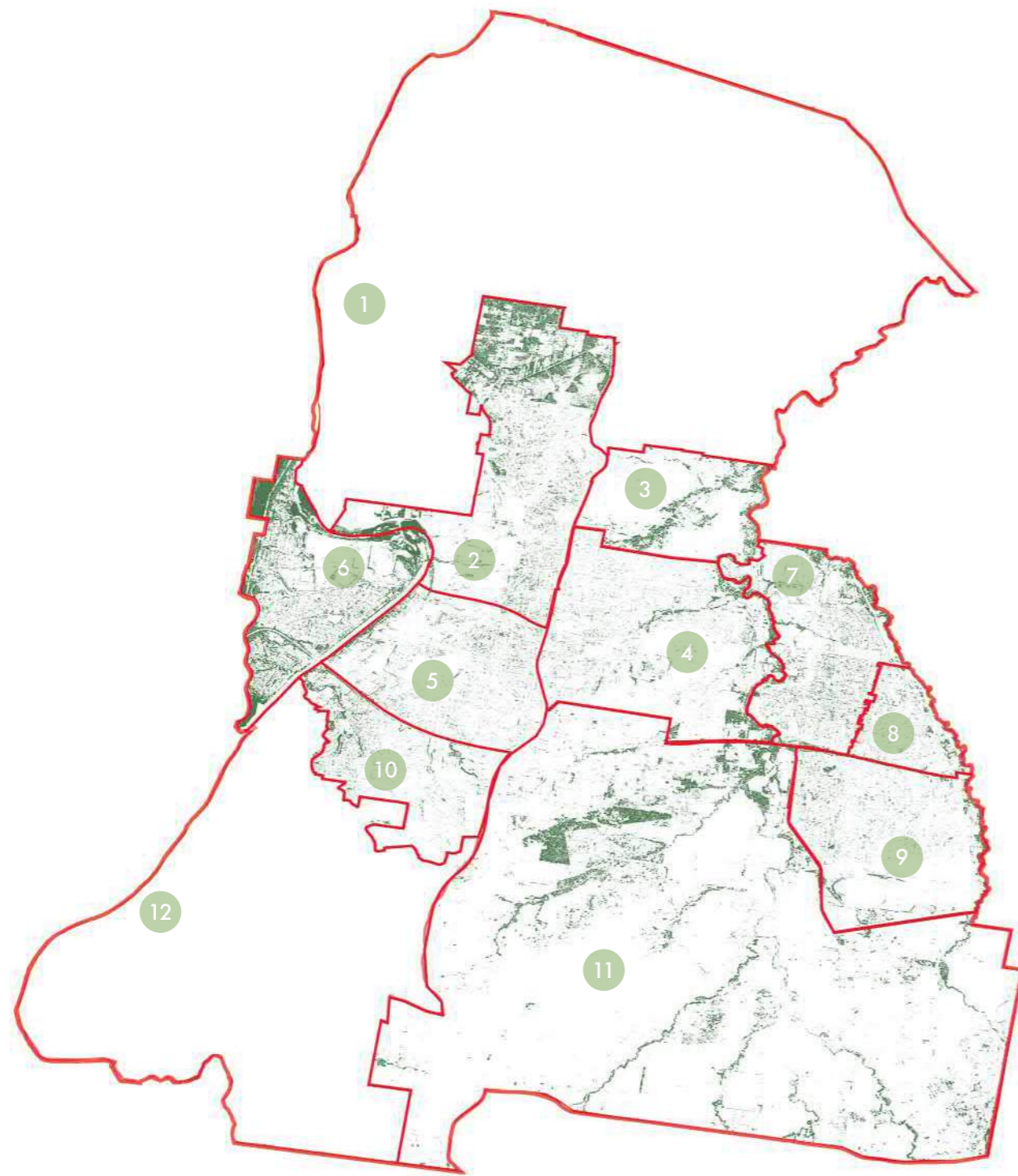


Figure 54. Tree Canopy Coverage - Geoscape Surface Cover data

Tree cover percentage targets and areas of benefit

The Draft Greener Places Design Guide identifies an ideal target of 40 percent tree cover for the Greater Sydney region by 2056.

Place based targets which are under investigation and the final Green Places Design Guide and Design and Place SEPP currently being drafted will provide more specific targets and should be referenced when determining optimum tree cover when designing and developing specific Penrith Green Grid implementation programs.

Setting an optimum tree cover percentage target needs to align with density and land-use. Open space networks where there is an existing ground plane of permeable (natural ground) surfaces provide a greater opportunity to achieve a higher percentage cover than streets and roads where the majority of space is paved or required for vehicles.

Precincts with existing high population densities, high urban heat

island effect and planned population increase should be prioritised in conjunction with the creation of green linkages along active transport routes and open space connections.

Measuring tree canopy and future change

Geoscape Surface Cover data has been used to set a benchmark for understanding existing tree canopy coverage across Penrith LGA.

Geoscape Surface Cover represents land cover categories. It's a raster dataset with a digital pixel representation of the different types of ground cover. Tree canopy cover percentages have been determined using pixel value 5 which represents trees. More information is available at <https://geoscape.com.au/data/surface-features/>

Data available did not cover all rural areas of the LGA and, as a result, tree canopy percentages figures are provided here for Precincts 2-11, being the urban precincts more likely to be subject to change.

Figures are provided to demonstrate the percent coverage of tree canopy in each Precinct.

These percentage figures can be used as a baseline for understanding existing tree canopy coverage and measuring changes as projects are implemented.

Further analysis is provided to demonstrate the percent of tree canopy on the publicly owned land in each Precinct. In some Precincts where there is very low overall canopy coverage, the figures show that tree presence is proportionally high on publicly owned land. This highlights the need to protect and maintain this existing vegetation and emphasises requirements for future developments to contribute to improving canopy coverage.

The contribution of existing tree canopy in undeveloped areas where there is likely to be change must be acknowledged, and the impact any removal of those trees will have on canopy coverage figures. This is particularly relevant given it will be at least 10+ years before any replacement trees planted as part of new development will be large enough to contribute to this measurement.

PRECINCT NUMBER	PRECINCT NAME	PRECINCT CANOPY COVERAGE	PRECINCT IN PUBLIC OWNERSHIP (INCLUDING ROADS)	TREE CANOPY ON PUBLIC LAND
2	Central North	19 %	34%	28%
3	East North	10 %	56%	66%
4	Central East	7 %	44%	55%
5	Central	7 %	38%	36%
6	Central West	30 %	37%	42%
7	East 1	15 %	37%	46%
8	East 2	10 %	45%	57%
9	East 3	6 %	36%	61%
10	Central South	9 %	35%	42%
11	South East	5 %	24%	39%

Parent Action	Action	Timeframe	Council's Role
Priority 6: Moving from Intention to Results			
Outcome 6: City of Penrith has high quality, diverse, ecologically responsive and connected green infrastructure			
Develop canopy targets and identify suburbs (new, existing and future) where there are opportunities for increasing canopy targets (LSPS)	Action 6.1 Identify tree canopy targets for Penrith, Kingswood, Werrington St Marys and Orchard Hills centres through the Corridor and Centres Strategy	Short - Medium	Plan
Develop and apply canopy cover targets for the Penrith LGA (Resilient Penrith Action Plan)			
Advocate to the State Government and developers for climate adapted buildings, increased percentage of pervious surfaces and greening within new developments/proposals. (Resilient Penrith Action Plan)	Action 6.2 Advocate to State government for increased tree canopy on infrastructure projects, including on primary movement corridors, in accordance with the final Greener Places Design Guide and Design and Place SEPP.	Ongoing	Advocate
Inclusion of urban heat and cooling the city principles within the Penrith LEP/DCP (Resilient Penrith Action Plan)	Action 6.3 Amend LEP/DCP to address urban heat. Include controls to implement green grid initiatives such as protecting and increasing vegetation to maximise shade and increasing the use of Water Sensitive Urban Design to assist in harvesting and reuse of water for cooling	Short	Plan
Introduce objectives, planning and development controls to deliver a cooler city (LSPS)			

Parent Action	Action	Timeframe	Council's Role
Enhance active transport routes to improve the walkability and rideability of Penrith (Resilient Penrith Action Plan)	Action 6.4 Use the Green Grid Strategy as a key input to the update of the Penrith Accessible Trails Hierarchy Strategy to ensure that the future active transport network is aligned to the green grid and that walking and cycling paths are shaded and cool	Short	Plan
Review and update our PATHS Strategy to deliver an integrated shared pathway network across our City			
	Action 6.5 Increase overall tree canopy coverage on Council's road projects and at-grade car parking in accordance with the final Greener Places Design Guide and Design and Place SEPP	Ongoing	Plan Deliver
	Action 6.6 Include Priority Future Connections and new open spaces in Council's City-Shaping Strategies and LEP/DCP	Medium-Long	Plan
	Action 6.7 Include requirements for the undergrounding of overhead infrastructure in new developments in Council's City-Shaping Strategies and LEP/DCP	Short-Medium	Plan
	Action 6.8 Advocate to State Government for the bundling and co-sharing of in ground utilities in common easements within verges to allow sufficient space for street trees.	Ongoing	Advocate



7.9 Review of Green Grid Strategy

The Green Grid Strategy will need to be reviewed as implementation proceeds. Review of the Strategy will be undertaken in response to the release of a new District Plan by the Greater Sydney Commission and updates of the Local Strategic Planning Statement.

Review of the Strategy may also be undertaken should results of tree canopy monitoring suggest changes to the Strategy are required.



CONCLUSION



8 CONCLUSION

8.1 Conclusion

Penrith is undergoing unprecedented change and the Green Grid is essential to the well-being of the community by creating shaded streets where people can walk to school and local shops, have fun in neighbourhood parks, cycle to work, and experience lush waterway corridors that cool the city.

Well-planned green infrastructure is fundamental in fostering healthy, happy communities that are sustainable now and into the future.

*Rob Stokes Minister for Planning and Public Spaces
Greener Places An urban green infrastructure design framework for NSW*

Today, Penrith –like all Councils in the Western Parkland City – faces a major challenge due to its growing population and the need to provide liveable neighbourhoods.

The Strategy aims to implement ‘a connected green network’ by redefining how State agencies and Council plan, design and manage green infrastructure. By initiating and implementing the Strategy, Council is embarking on a journey to deliver and transform Penrith by embedding green spaces to the ongoing prosperity of generations to come.

The Green Grid will keep Penrith cool, encourage healthy lifestyles, support walking and cycling, provide better access to open spaces, enhance bushland and support ecological resilience.

Priority Future Projects, Further Actions

Priority Projects, Next Steps

The following pages outline the priority projects in more detail.

These priority projects are not funded.

After receiving project funding, the first group of Priority projects require specific actions to ensure they are completed within best practice scenarios.

The projects require refinement through design development in response to on-going Key Stakeholder engagement.

Priority Project Action List

Confirm and identify ownership and stakeholders that should be consulted on the proposals.

Identify stakeholders to be consulted for approval to proceed including Community groups

Confirm if project is to be undertaken in house or outsourced

For each project to proceed to construction, prepare a full features survey suitable for a consultant team to utilise in the preparation of construction documentation. Survey to include all above and below ground infrastructure and suitable for inclusion in Council's database.

Phases for Project Design and Documentation

1. Prepare developed concept plan of project for approval by Council, cost planning and Community engagement.
2. Waterway and ecological projects will require review and approval by in house engineers and the relevant State Authorities.
3. Transport and traffic related projects will require TfNSW approval (State Roads) and Council's traffic and transport engineers.
4. Develop approved Concept for the preparation of Detailed Design and Construction Documentation.
5. Undertake approvals of Documentation to proceed to Tender and Construction.
6. Construction Stage
7. Defects Liability period and on-going monitoring and maintenance
8. Community engagement post construction
9. Project to be added to Councils data base

Priority Future Projects

The Priority Future Projects are identified due to their importance in filling missing linkages.

The planning for these linkages needs to occur in the short term to take advantage of the changes

within the LGA. These projects are not all on Council owned land, involve waterways or TfNSW and many are of a significant scale.

For each, the project intent and magnitude needs to be further explored with key stakeholders and a plan outlining the intended outcomes required to implement the projects should be prepared.

This material can be used to guide the planning and development of these projects within precincts.

PRIORITY PROJECT 4.2 : CAMBRIDGE HIGH SCHOOL

Local Greening Project to Harrow Road along frontage to Cambridge Park High School



Figure 55. Concept Plan - Cambridge Park High School Harrow Road

LEGEND

- 1 Planted islands to kerbside lanes

Note: Projects require refinement through design development in response to Key Stakeholder engagement.

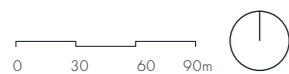


Figure 56. Existing View - Looking west down Harrow Road



Figure 57. Street tree planting and kerb blisters with trees to shade road pavement

CATALYST PROJECT 4.4: WERRINGTON CREEK

Shared path and creek restoration from Victoria Street, under Penrith Rail line corridor to Cosgrove Crescent



LEGEND

- 1 Potential shared path to Victoria St and Werrington Creek open space network to the north
- 2 Creek restoration to extend to Victoria St
- 3 Existing pedestrian bridge
- 4 Shared path link under train line
- 5 Restoration of creek alignment to eliminate erosion to create a biodiverse environment
- 6 Shared path linked to Great Western Highway
- 7 Potential signalised crossing to link to Werrington Creek open space corridor to the south

Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 58. Concept Plan - Shared path connection and creek restoration to connect under train line to improve pedestrian link between Werrington and Kingswood

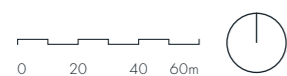


Figure 59. Existing View - Looking north at train line over drainage culverts with Great Western Highway beyond



Figure 60. Naturalized drainage channel with shared path to Great Western Highway

PRIORITY PROJECT 5.16: JAMISON ROAD CYCLE LINK

Connecting Mulgoa Road to Tench Reserve and Great River Walk.

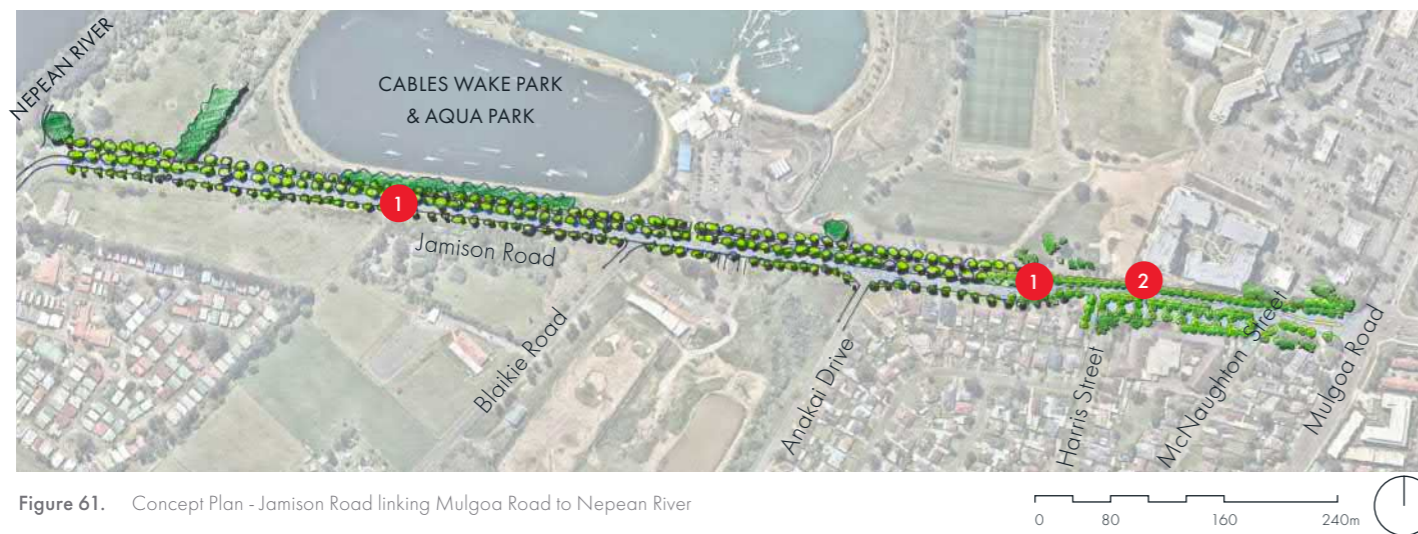


Figure 61. Concept Plan - Jamison Road linking Mulgoa Road to Nepean River

LEGEND

- 1 Supplementary planting along both sides of Jamison Road
- 2 Shared Path linking Mulgoa Road to Tench Reserve (missing segment)

Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 62. Proposed View - Looking east down Mulgoa Road



Figure 63. Shared path connection to Mulgoa Road, street tree planting and car park planting

PRIORITY PROJECT 5.17: SURVEYORS CREEK

Shared path and naturalisation of section from Ikin Street to M4 Western Motorway



LEGEND

- 1 Shared path from Ikin Street pedestrian crossing to York Road
- 2 Removal of concrete channel and restoration of creek
- 3 Removal of concrete channel, restoration of creek. Existing trees retained

Note: Projects require refinement through design development in response to Key Stakeholder engagement.

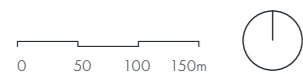


Figure 64. Concept plan - Surveyors Creek open space and Hydrological connection Ikin Street to M4 Motorway



Figure 65. Existing View - Looking north towards existing pedestrian bridge



Figure 66. Shared path connection, naturalisation of concrete channel and tree canopy

CATALYST PROJECT 5.18: PEACH TREE CREEK

Open space and hydrological corridor Great Western Highway to Jamison Road, east west links



LEGEND

- 1 Development site
- 2 Pedestrian bridge across Mulgoa Road connecting to development site podium level
- 3 Landscaped podium
- 4 Recreation Avenue link
- 5 Fink Avenue link
- 6 Peach Tree Creek hydrological corridor
- 7 Potential link to Station Street
- 8 Jamison Road link

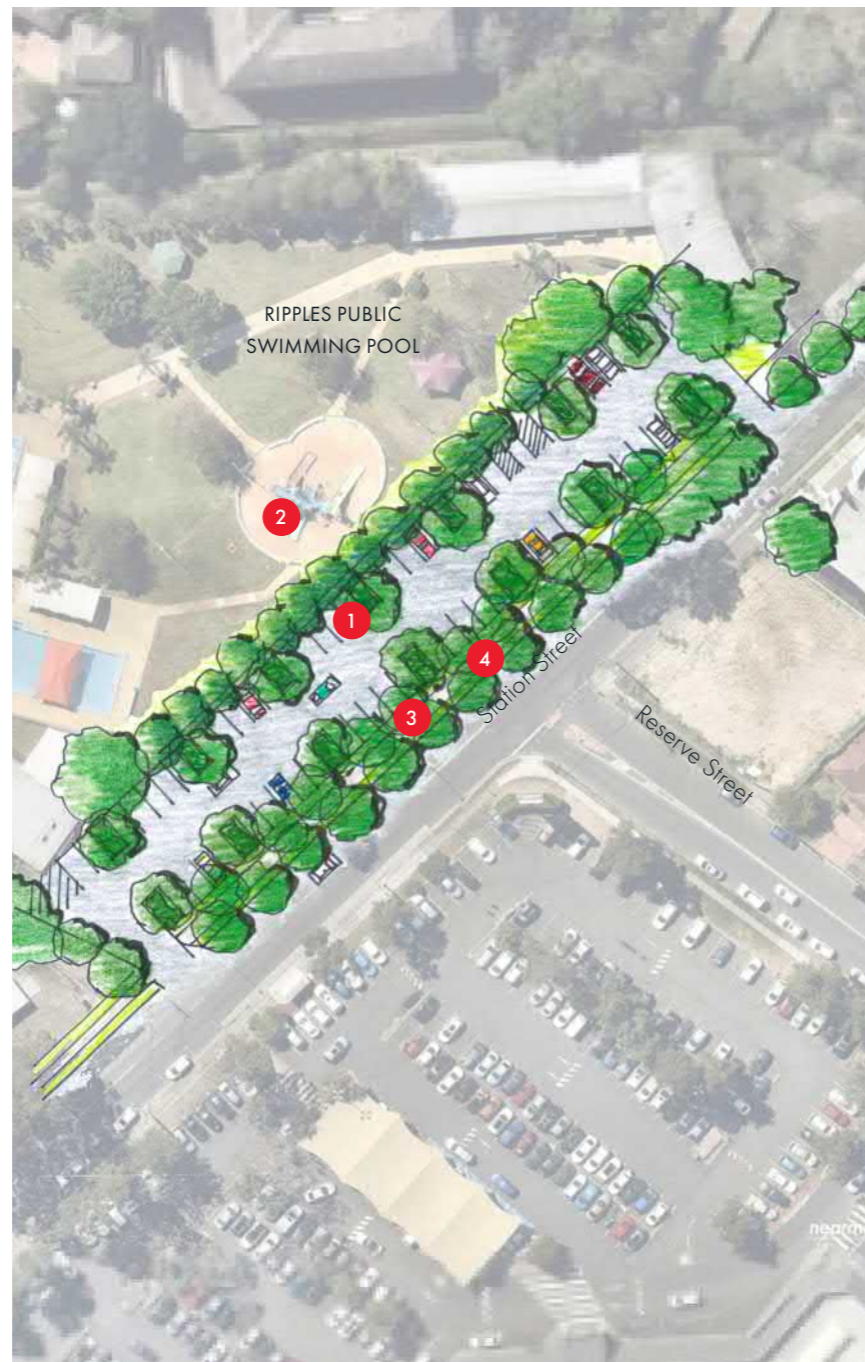
Note: Projects require refinement through design development in response to Key Stakeholder engagement.

Figure 67. Concept plan - Peach Tree Creek



PRIORITY PROJECT 5.19: RIPPLES PUBLIC SWIMMING POOL

Car park greening, part of Penrith Train Station to Panthers Stadium and Jamison Open Space Corridor



LEGEND

- 1 Car park planting within bays
- 2 Supplementary planting within Ripples
- 3 Street tree planting
- 4 Proposed cycle link along Station Street

Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 68. Concept plan - Ripples Swimming Pool car park greening.



Figure 69. Existing View - Looking south west within Ripples car park



Figure 70. Planting within parking bays (approximately, every 5 car spaces), street trees and planting to Ripples

PRIORITY PROJECT 6.2: GREAT WESTERN HIGHWAY: PENRITH TO BLACKHEATH CYCLE LINK

Section in Emu Plains linking to Emu Plains Train station



LEGEND

- 1 Planting to Nepean Creative & Performing Arts High School
- 2 Street tree planting to western side of GWH
- 3 Median planting - Trees
- 4 Median planting, under powerlines small trees and shrubs
- 5 Imperial Avenue on road cycleway and tree planting to eastern edge

Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 71. Concept plan - Great Western Highway planting and additional trees along Imperial Avenue for on road cycle route



Figure 72. Existing View - Looking north on Great Western Highway



Figure 73. Median planting to shade road pavement and low trees and shrubs under power lines

PRIORITY PROJECT 6.9 : EMU PLAINS CAR PARK

Car park on Billington Place, planting opportunity



LEGEND

- 1 Street tree planting along Billington Place
- 2 Garden bed with tree planting
- 3 Car park bay planting
- 4 Supplementary planting to car park edges
- 5 Concrete islands replaced with planting

Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 74. Concept plan - commuter car park with garden areas and tree planting.



Figure 75. Existing View - Looking from car park towards Billington Place



Figure 76. Replacement of concrete islands with planted garden beds, trees and additional planting throughout

PRIORITY PROJECT 7.14 : THE KINGSWAY, ST MARYS

Shared path and planting to car spaces from Charles Hackett Drive to Werrington Road (Kurrambee School), South Creek Bridge Crossing for shared path.



Figure 77. Concept plan - The Kingsway shared path connection to Charles Hackett Drive with proposed bridge connection at Ropes Creek.



LEGEND

- 1 Planting to car parking spaces
- 2 Shared path connecting from the Kingsway fields to Ropes Creek
- 3 New shared path bridge across Ropes Creek to connect Charles Hackett Drive shared path
- 4 Supplementary planting along the Kingsway

Note: Projects require refinement through design development in response to Key Stakeholder engagement.

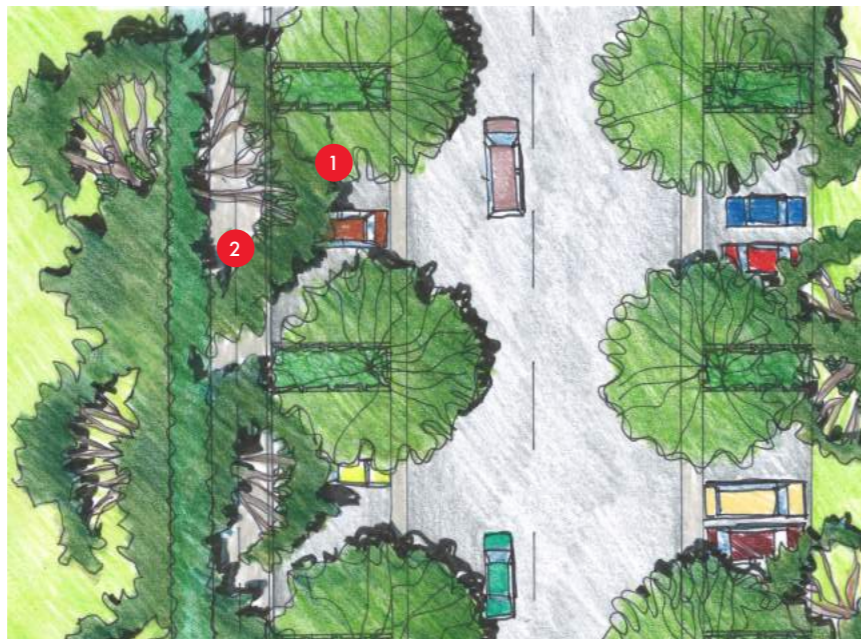


Figure 78. Detail plan - The Kingsway shared path and car park planted islands



Figure 79. Existing View - Looking east along The Kingsway towards Ropes Creek



Figure 80. Showing shared path, planting to The Kingsway Touch fields and planted islands between car spaces

PRIORITY PROJECT 7.18 : CHARLES HACKETT DRIVE

From Great Western Highway to Queen Street, shared path link to St Marys Village Shopping and St Marys Public School



LEGEND

- 1 Underground overhead power lines on east side
- 2 Shared path linking from Great Western Highway to Queen Street
- 3 The Kingsway cycle link
- 4 Planting to bus stop
- 5 South Creek
- 6 Gateway tree planting
- 7 Connection to residential precinct south of Great Western Highway

Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 81. Concept plan - Charles Hackett Drive shared path connection to Queen Street.

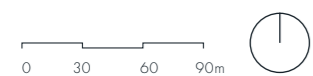


Figure 82. Existing View - Looking south along Charles Hackett Drive towards Great Western Highway



Figure 83. Shared path on eastern side of Charles Hackett Drive and proposed tree canopy

PRIORITY PROJECT 7.20 : KING STREET, ST MARYS

Active transport linking Glossop Street to Queen Street past Bennett Park



Figure 84. Concept plan - King Street on road cycle link and green corridor

LEGEND

- 1 On road cycle lanes linking to Queen Street
- 2 Underground overhead powerlines on south side
- 3 Perimeter planting to Bennett Park
- 4 Proposed mixed recreation space for Bennett Park from Sport and Rec Strategy in concept

Note: Projects require refinement through design development in response to Key Stakeholder engagement.

Note: Park planting will need to be determined following consideration of contamination.



Figure 85. Existing View - Looking west along King Street



Figure 86. King Street on road cycle lane, overhead power lines relocated underground and proposed continuous tree canopy

PRIORITY PROJECT 7.25: DEBRINCAT AVENUE, NORTH ST MARYS

Active transport link from Ropes Creek to Glossop Street

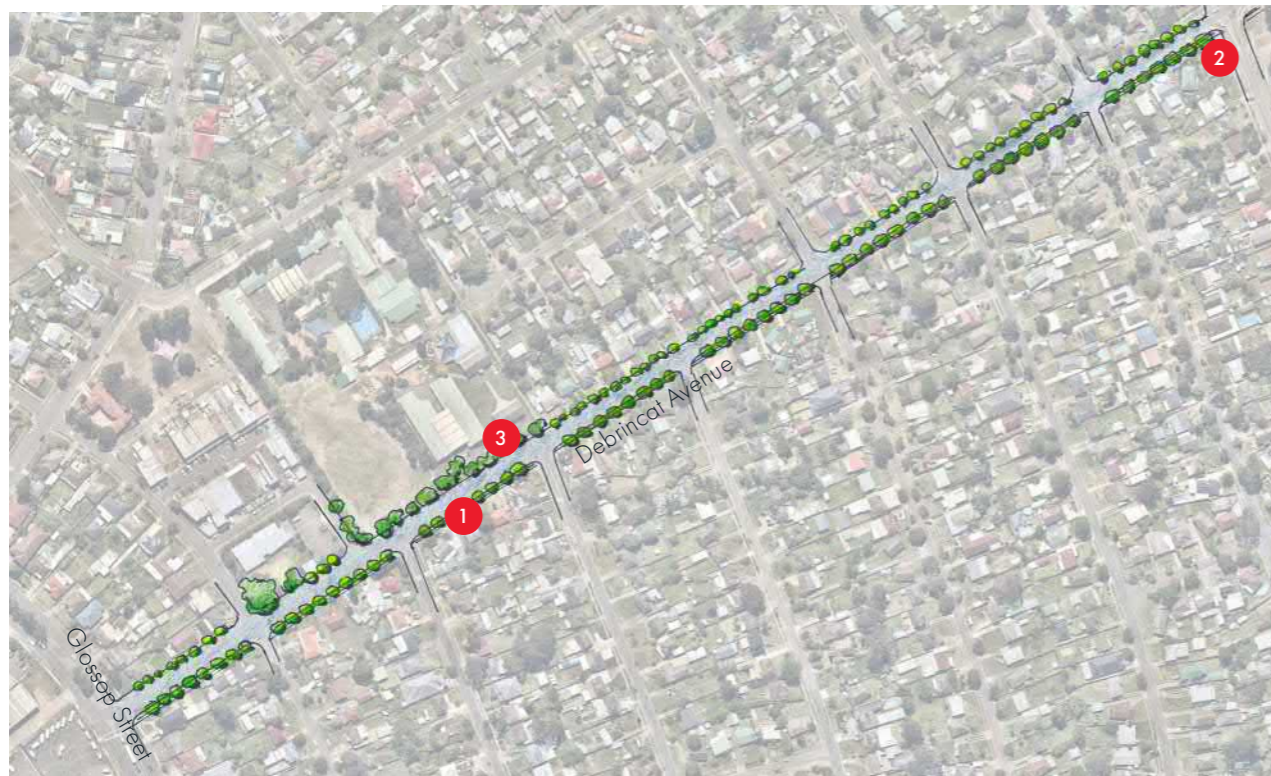


Figure 87. Concept plan - Debrincat Avenue active transport link to Ropes Creek

LEGEND

- 1 Shared path link to Ropes Creek
- 2 To Ropes Creek and Boronia Park
- 3 Supplementary tree planting under power lines

Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 88. Existing View - Looking north east along Debrincat Avenue



Figure 89. Shared path connection on eastern side with tree canopy and supplementary planting under existing power lines

CATALYST PROJECT 8.1 : ROPES CREEK RECREATIONAL & HYDROLOGICAL CORRIDOR

Ropes Creek recreational and hydrological corridor, incl. Kevin Dwyer Park from rail corridor, Great Western Highway to Western Motorway (WDGGP, Roper Road Green Corridor Masterplan)



LEGEND

- 1 Connection to Great Western Highway
- 2 Planting to Kevin Dwyer Park
- 3 Planting to car park
- 4 North pond realigned and used for storage and irrigation
- 5 New field and cricket oval
- 6 South pond realigned to be used as a sedimentation pond
- 7 Channel from culvert extension at Roper Road
- 8 Ropes Creek corridor
- 9 Linkages to local green grid project 8.8 Colyton Shopping Centre and Gilmore Street Park
- 10 Potential shared path links and circuits

Note: Projects require refinement through design development in response to Key Stakeholder engagement.

Figure 90. Concept plan - Ropes Creek Recreational & Hydrological Corridor



PRIORITY PROJECT 9.19 : OPEN SPACE NETWORK & HYDROLOGICAL CORRIDOR

(South Creek and tributaries), Mamre Road shared path through Peter Kearns Memorial Oval to Banks Drive (Priority Project) connection to Precinct 11 project 11.12 across Mamre Road.



LEGEND

- 1 Shared path link from Mamre Road linking to school and Banks Drive
 - 2 Riparian low flow corridor
 - 3 Opportunity to lower fences facing open space
 - 4 Existing pedestrian bridge
 - 5 East West link to 11.12 Orchard Hills.
 - 6 Existing link
 - 7 An upgrade to this playground is being planned including increased accessibility.
- Note: This is part of a designated biodiversity corridor and will require bio specialist consultation in the design.
- Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 91. Concept plan - Shared Path connection from Mamre Road to Banks Drive, Park improvements including seating areas and additional tree canopy



Figure 92. Existing View - Looking north within park towards Banks Public School



Figure 93. Shared path connection with seating areas and additional tree canopy

PRIORITY PROJECT 10.5: SCHOOL HOUSE CREEK OPEN SPACE NETWORK & HYDROLOGICAL CORRIDOR

from Nepean River, Mulgoa Road, Glenmore Parkway including Glenmore Loch, Factory Road, Loftus Street link to River



Project Background

School House Creek Open Space Network and Hydrological Corridor from Nepean River, Mulgoa Road, Glenmore Parkway including Glenmore Loch, Rotary Park and Wentworth Gardens to Ched Towns Reserve, has been categorised as Green Grid Project No. 10.5.

As part of this project, a shared path along Loftus Street from the existing bridge crossing over the creek joining to Factory Road and linking the Mulgoa Road shared path system to the Nepean River, has been identified as a Priority Project and is illustrated on the following page.

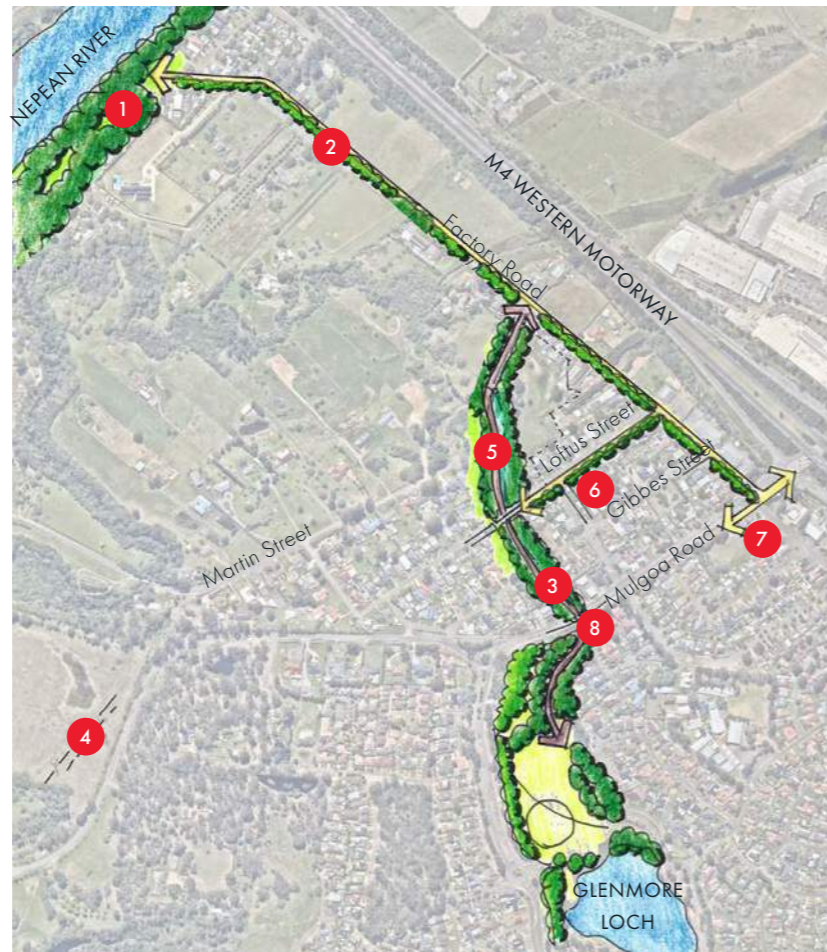


Figure 94. Concept plan - Factory Road, Loftus Street on road cycle link to open space corridor and Nepean River.

LEGEND

- 1 Link to Nepean River
- 2 Factory Road, shared path on western side, with street tree planting
- 3 Potential future link from Glenmore Loch along School House Creek, utilising road easement and council owned lands to Factory Road
- 4 Electrical easement
- 5 Future shared path connection on council owned land
- 6 Loftus Street shared path and street tree planting
- 7 Shared path link to Mulgoa Road cycleway
- 8 Future link across Mulgoa Road

Note: Projects require refinement through design development in response to Key Stakeholder engagement.



Figure 95. Existing View - Looking along Loftus Street towards Factory Road.



Figure 96. On road cycle route linking to Factory Road shared path with tree canopy planting

In addition, a Priority Future Connection along School House Creek, within Council owned land and along a road easement connecting to Factory Road is also illustrated.

Factory Road has been identified as the preferred cycle link to the Nepean River to maintain the creek corridor as an ecological/hydrological environment and to minimise additional pavement to the Precinct. Access to the creek from key points will be possible

Appendix B Data Set Table

Data Set Group	Data Set	Source
Cadastral	Property Boundary	PCC
Cadastral	Crown Land	PCC
Cadastral	Council Owned land	PCC
Administration	Aggregated Areas - Sport and Rec Strategy to use as base for Penrith LGA Green Grid Strategy sub division	PCC
Network Connectivity	Bicycle network -existing, funded, proposed	partial (openstreetmap)
Network Connectivity	Walking network- pedestrian footpaths	partial (openstreetmap)
Network Connectivity	Street network-roads	openstreetmap
Network Connectivity	Public Transport- rail, bus routes	General Transit Feed Specifications(GTFS)
Network Connectivity	Easements - electrical, drainage, access, transmission, water	PCC
Network Connectivity	Walking catchments at 400 and 800m, (10mins)	Tract Consultants
Topography	Contextual contours	PCC
Topography	Contextual elevation	PCC
Topography	Contextual slope	PCC
Topography	Contextual surface cover	PCC
Topography	Contextual Vegetation	PCC
Ecological	NPWS reserves-National Park, National reserve, regional park	PCC
Ecological	Penrith Council Parks- Parks CCM (Natural Area) Parks Community	PCC
Ecological	Ecological areas- HEV waterways (Penrith), Cumberland sub region BIO Map	PCC
Ecology	Biodiversity Investment Opportunities	Office of Environment and Heritage
Ecology	Bushfire Prone Area	PCC
Ecology	Surface Cover	PCC
Ecology	Canopy cover	PCC
Hydrology	High Ecological Value Areas	PCC
Hydrology	Waterways State level	PCC
Hydrology	Waterways local level LGA level waterways	PCC
Hydrology	Flooding area	data from 'Nepean River Flood Study Worley Parsons Group 2018'
Hydrological	Waterbody area, watercourse	PCC
Hydrological	General cultural area-pondage	PCC
Hydrological	Distinctive Land Surface Area (DLSA)- land subject to inundation, swamp wetlands, water course, drainage storage	PCC
Hydrological	Hydrological -Hydrological areas, hydro line, watercourse	PCC
Open Space	State level	Derived from State Zoning
Open Space	Local level -Parks CCM, Parks Community	PCC open space dataset
Open Space	Green Grid (excluding conservation, ecology, hydrology use)	NSW Planning Portal
Demographics	Population Density	2016 census
Demographics	Population Forecast	NSW State forecasts
Demographics	Socio-Economic indexes for areas (SEIFA) disadvantage	(SA1 - Census 2016)
Urban Heat	Heat Sensor Data i.e. areas of heat stress	'Air temperature data © S. Pfautsch Western Sydney University'
Infrastructure	Overhead Power Lines	PCC
Infrastructure	Major Underground Services sewer/water/gas/electrical/internet	PCC
Infrastructure	Car Parks i.e. possible sites for park conversion	PCC
Heritage	Archaeological, conservation, general	PCC
Vegetation	Tree canopy, shrub layer, vegetated ground cover	data from Geoscape: https://geoscape.com.au/data/surface-features/

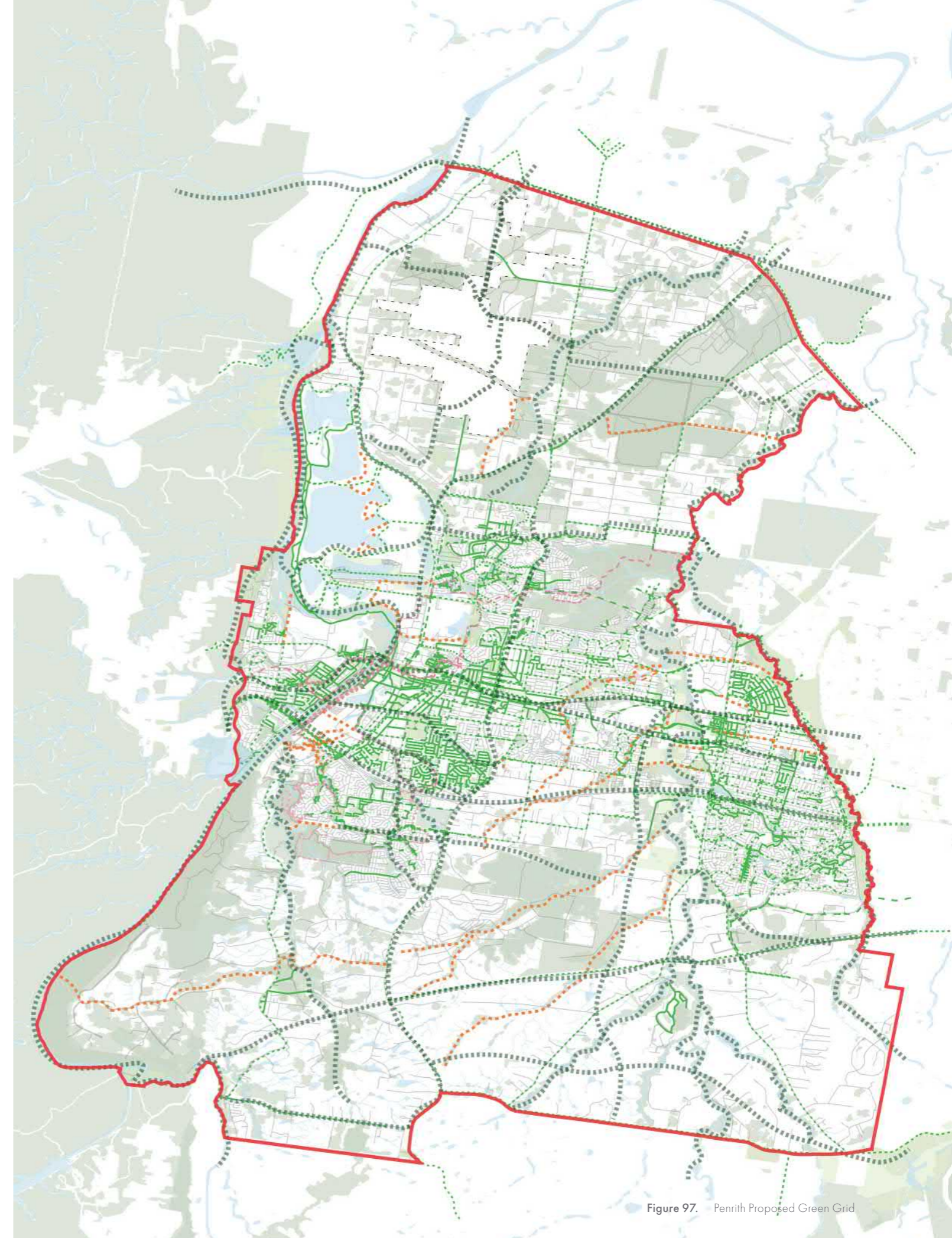


Figure 97. Penrith Proposed Green Grid

