Appendix M

Ecologically Sustainable Development Report

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18-May-2018

Ecologically Sustainable Development Report

Cudgegong Road Station Precinct South

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Ecologically Sustainable Development Report

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Executive Summary

This report addresses the Secretary's environmental assessment requirements (SEARs) for the preparation of the Environmental Impact Statement (EIS) on the Ecologically Sustainable Developments (ESD) aspects.

This report details how ESD principles (as defined in clause 7(4) of Schedule 2 of the EP&A Regulation 2000) will be incorporated in the design, construction and ongoing operation of the development - at this concept stage. More detail on ESD principles will be provided as part of the future detailed applications. This report also includes a framework for how the proposed development will reflect best practice sustainable building principles to improve environmental performance, including energy and water efficient design and technology and use of renewable energy. The framework identifies baseline ESD benchmarks and aspirational targets.

1.0 Introduction

1.1 Study Aims

AECOM has been engaged to carry out an Ecologically Sustainable Development Report to support the State Significant Development Application (SSDA) for the Station Precinct South concept proposal. The concept proposal is for approximately 1,100 dwellings and around 9,000 sqm of retail, commercial and community uses. It also includes a central park, new streets and supporting public domain.

AECOM understands the need for a robust and effective ESD assessment to drive sustainable outcomes for the surrounding environment and community. This report demonstrates an appreciation of the sustainability features of the project to inform the development's approval process.

The purpose of this report is to provide a sustainability assessment of the revised Bennett and Trimble Concept Plan (dated 5/2/2018) and its ability to meet the needs of the community and the environment from design and construction through to immediate and future operation of the precinct. It assesses compliance against the proposed Secretary's Environmental Assessment Requirements (SEARs), relevant Development Control Plans (DCPs), State Environmental Planning Policies (SEPPs) and ESD principles as defined in clause 7(4) of Schedule 2 of the EP&A Regulation 2000. The report demonstrates compliance using the Landcom *Sustainable Places Strategy* and GBCA *Green Star Communities National Framework* principles with reference to relevant planning controls.

The ESD framework assessment in this report aims to identify recommendations for improvement and inform specific targets to guide future planning and design development.

1.2 Proposed Development

The NSW Government is currently building the Sydney Metro Northwest (SMNW) that is due to start operations in 2019. The SMNW is Stage 1 of the overall Sydney Metro project and involves the construction of eight new metro stations supporting infrastructure between Cudgegong Road and Epping and converting five existing stations between Epping and Chatswood. Stage 2 will deliver a new metro rail line from Chatswood through Sydney's CBD to Sydenham (Sydney Metro City and Southwest).

Landcom and the Sydney Metro Delivery Office (SMDO), part of Transport for NSW (TfNSW), are working in collaboration to develop walkable, attractive, mixed use places around the SMNW stations. This includes using the surplus government owned land located around the Cudgegong Road Station.

The subject site, the Cudgegong Road Station Precinct South, is located between Cudgegong Road, Tallawong Road, Schofields Road and the Metro corridor and comprises around 7.8ha of government owned land. It is within the southern part of the broader Cudgegong Road Station Precinct (Area 20) of the North West Priority Growth Area, a substantial land release area for homes and jobs in Sydney's northwest.

The Cudgegong Station Precinct is located within the Blacktown City Council Local Government Area (LGA) and is approximately 2km west of Rouse Hill Town Centre and 45km northwest of the Sydney CBD. The Cudgegong Road Station Precinct South Developable Government Land is bound by Tallawong Road to the West, Cudgegong Road to the East, Schofields Road to the South and Cudgegong Metro Station to the North. The current site can be characterised as having semi-rural lots to the north and low density residential to the south. The site context is shown in Figure 1 below.

Figure 1: Site Context

Landcom is managing the Cudgegong Road Station Precinct South development project as part of its role in planning and delivering desirable centres with an emphasis on community and affordable housing. This ESD study focuses on lots to the South of the Sydney Metro rail alignment as part of planning approval, and it is anticipated subsequent studies will be undertaken for remaining Cudgegong Road Station Precinct lots.

The Cudgegong Road Station Precinct South project forms part of the overarching Sydney Metro Northwest Urban Transformation Program development area. Precinct enabling and augmentation works provided by Sydney Metro to appropriately service the adjoining superlots are ongoing.

A site plan of the Cudgegong Road Station Precinct South development and footprint for consideration in this report is shown below in Figure 2.

Figure 2 Site Plan

The Cudgegong Road Station Precinct South project will eventually involve the delivery of six (6) lots offering residential, commercial, retail and community services. The Bennett and Trimble urban design plan for the two lots in Figure 2 includes space for 4,500 m^2 retail GFA, 3,000 m^2 commercial GFA, 1,500 m^2 community use (including 800 m^2 child care, 400 m^2 health and fitness, 300 m^2 flexible community space).

The development will comprise of various public facilities including a local park and new precinct streets to be constructed. The development concept plan for the site is presented below in Figure 3 below.

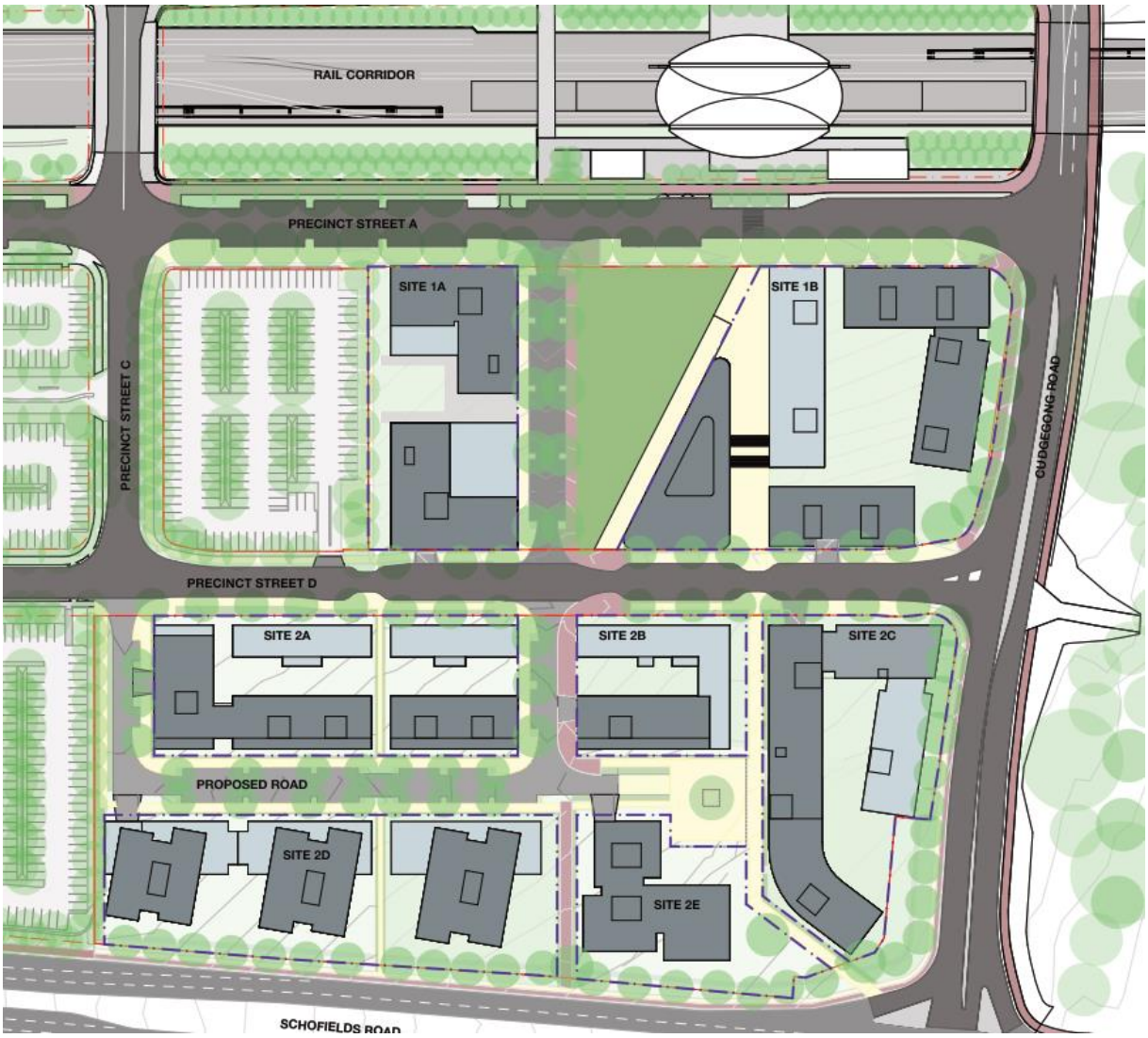

Figure 3 Development Concept Plan

1.3 Planning Context

This section provides an outline of relevant project policy and planning requirements for consideration in the context of Cudgegong Road Station Precinct South ESD.

1.3.1 Regional and Local Policy

Greater Sydney Commission 'Our Greater Sydney 2056, Central City District Plan

The Greater Sydney Commission (GCC) has developed a number of sustainability objectives for the Central City District in which Cudgegong resides. These include:

- *Planning Priority C13. Protecting and improving the health and enjoyment of the District's Waterways.*
- *Planning Priority C14. Creating a Parkland City urban structure and identity, with South Creek as a defining spatial element.*
- *Planning Priority C15. Protecting and enhancing bushland, biodiversity and scenic and cultural landscapes*
- *Planning Priority C16. Increasing urban tree canopy cover and delivering Green grid connections.*
- *Planning Priority C17. Delivering high quality open space.*
- *Planning Priority C18. Better managing rural areas.*
- *Planning Priority C19. Reducing carbon emissions and managing energy, water and waste effectively.*
- *Planning Priority C20. Adapting to the impacts of urban and natural hazards and climate change.*

State Environmental Planning Policies (SEPPs) (Sydney Region Growth Centres)

Relevant SEPP'S specific to Cudgegong Road Station Precinct South ESD include:

- Sydney Region Growth Centres (Area 20 Precinct Plan)
- North West Growth Centre Maps
- Building Sustainability Index (BASIX) State Environmental Planning Policy

North West Rail Link (Sydney Metro) Environmental Impact Statement (1 & 2)

The existing planning conditions for the Cudgegong Road Station Precinct South are made up of the State Significant Infrastructure (SSI) planning approval under the stations, rail infrastructure and systems planning approval. North West Rail Link EIS 2 assessed impacts for the Cudgegong Road station and surrounding area including the proposed Town Centre site. These conditions are to be upheld in Cudgegong Road Station Precinct South planning approvals and so are referenced for consistency in this report.

1.3.2 Planning Controls

Blacktown City Council Growth Centre Precincts Development Control Plan and Schedule 4 (Area 20 Precinct)

The Blacktown City Council Growth Centre Precincts DCP details the following ESD objectives and controls relevant to Cudgegong Road Station Precinct South:

Objectives

a. *To improve energy efficiency through the design and sitting of buildings;*
b. *To ensure that developments are environmentally sustainable in terms of energy and water use, and management of waste and discharge.*
c. *To encourage the utilisation of materials and construction techniques with low energy inputs in their production for construction energy systems.*

Controls

1. *A Site Water Management Plan must be prepared in accordance with Appendix F.*
2. *Development Applications are required to demonstrate consideration of:*
    - *measures that will reduce waste and conserve water through water recycling;*
    - *measures to minimise run-off and stormwater generation;*
    - *implementing total water cycle management by including measures that reduce consumption of potable water for non-potable uses, minimise site run-off and promote stormwater re-use;*
    - *utilising recycled materials and renewable building resources;*
    - *promoting biological diversity through appropriate retention, planting and maintenance of indigenous flora of the area;*
    - *implementing a waste management strategy that promotes the overall reduction of waste levels;*
    - *and promoting the achievement of the 60 percent waste reduction target for New South Wales; and*
    - *implementing energy conservation measures that include reducing energy consumption and increasing inherent energy efficiency through design and materials selection, and adopting energy management plans.*
3. *Development Applications are required to demonstrate that consideration has been given to promoting ecologically sustainable transport by complementing and reinforcing the development and use of the existing and planned integrated public transport, pedestrian and cycling networks servicing the site.*
4. *Roof stormwater should be collected in tanks or street level reticulation which would serve as a retention system. The water in the retention system would be available for use for non-potable uses such as the watering of landscaped areas and use in toilet and hot water systems.*
5. *Consideration should be given to the feasibility of any measures to substitute grid-source power with environmentally sustainable alternatives such as tri-generation (green transformers), co-generation (i.e. recovery of waste energy) or photovoltaics.*
6. *New commercial buildings must achieve a minimum 4 star Green Star rating from the Green Building Council of Australia. Refer to the 'Green Star – Office As Built v3 Technical Manual'.*
7. *New industrial and light industrial buildings must achieve a minimum 4 star Green Star rating from the Green Building Council of Australia from such time that an Industrial Tool has been adopted.*
8. *Development shall incorporate water efficient fixtures such as taps, showerheads, and toilets. The fixtures must be rated to at least AAA under the National Water Conservation Rating and Labelling Scheme. Where the building or development is water intensive (ie. high water user), specific water conservation objectives must be resolved with Council.*
9. *Appropriate use of energy efficient materials during construction is to be demonstrated.*
10. *Development should incorporate energy efficient hot water systems, air-conditioning, lighting and lighting control systems*

Request for Secretary's Environmental Assessment Requirements (SEARs)

The Request for Secretary's Environmental Assessment Requirements for Cudgegong Road Station Precinct South South includes an ESD commitment for accompaniment in the EIS.

The EIS will be accompanied by a report addressing how ecologically sustainable development (ESD) principles will be incorporated in the design, construction and ongoing states and operation of the development. In particular, it will incorporate a public domain and infrastructure strategy that outlines

resource, energy and water efficiency initiatives, including the use of sustainable technologies and/or renewable energy, considering alternative servicing strategies such as precinct based power generation or integrated water systems.

The ESD report will take into account Landcom's sustainability policy and requirements.

The above commitments are subject to approval and may be subsequently modified.

1.4 Study Approach

This report has been developed to meet the following guiding principles to enhance ESD outcomes for Cudgegong Road Station Precinct South and the surrounding precinct:

- Develop a framework to address ESD SEARs requirements for Cudgegong Road Station Precinct South and provide detailed discussion and recommendations to inform the project Development Application (DA) and guide sustainable outcomes in future planning, design, construction and operation.
- Develop an ESD framework that aligns with the principles provided in the Landcom Sustainable Places Strategy. This will include assessment in line with the GBCA Green Star Communities National Framework principles to align with industry best practice ESD.
- Assess the ESD performance of the revised Bennett and Trimble Master Plan against ESD framework indicators and provide discussion on compliance.
- Provide a set of recommendations for further consideration in future planning and design stages. This report seeks to focus on broad precinct planning considerations in the context of the revised Bennett and Trimble Cudgegong Master Plan and to inform future planning and design development, leaving the adoption of building specific measures for future design consideration.
- Consult with key stakeholders to identify ESD priorities for Cudgegong Road Station Precinct South. Adopt stakeholder initiatives in the recommendations section of the report where absent from the reviewed Master Plan, applicable to this stage of planning and feasible for implementation in the Cudgegong Road Station Precinct South precinct.
- Develop a set of specific precinct targets to guide future planning and design development and secure key ESD deliverables.

2.0 Ecological Sustainable Development

2.1 ESD Overview

Australia's National Strategy for Ecologically Sustainable Development (1992) defines ecologically sustainable development as: *'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'*. Put simply, ESD is about the symbiotic relationship between community members and their interaction with their environment.

For the purposes of meeting ESD planning requirements, the Environment Planning and Assessment Act adopts the definition of Ecologically Sustainable Development (ESD) found in *the Protection of the Environment Administration Act 1991*. Section 2 of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes, and that ESD can be achieved through the implementation of the following principles:

- *Integration Principle*
- *The Precautionary Principle*
- *Inter-Generational Equity*
- *Conservation of Biological Diversity and Ecological Integrity*
- *Improved Valuation, Pricing and Incentive Mechanisms*

A development achieving heightened ESD outcomes needs to consider a number of factors in planning. The interaction between urban design and functional efficiency is important to understand, and requires collaboration between technical leads (e.g. stormwater, utilities, transport leads) and urban planners to decipher the best precinct wide design solution to adopt. Design outcomes need to be fully considered and justified not just for their direct functionality but for their interaction with the environment, community and other design initiatives across the life of the asset. This means simply not just choosing the most sustainable design features now, but anticipating how the community and the way the precinct operates will evolve over time and how these assets will be maintained.

This ESD report sets the vision and the intent for Cudgegong Road Station Precinct South but does not necessarily stipulate a final design solution to provide flexibility in design or technology choice. Effective governance and timing will be important to realise visions for sustainability and it is recommended a governance framework be established to manage progress towards achieving these goals.

2.2 Sustainability for Landcom

Landcom have set the following vision as outlined in Landcom *Sustainable Places Strategy* (2017):

"We will deliver world class sustainability outcomes across our portfolio"

The strategy sets a number of goals for Landcom developments defined by four main categories; Climate Resilience Places; Healthy and Inclusive Places; Productive Places; Accountable and Collaborative. Under each category is a leadership goal, set of targets and priorities to provide a framework to incrementally improve Landcom's portfolio performance over time.

The Sustainable Places Strategy is a newly issued strategy developed to provide future precinct developments with a set of goals to drive sustainable outcomes. As the strategy was issued prior to planning commencement for Cudgegong Road Station Precinct South, it is acknowledged that some strategy targets may be difficult to achieve as precinct planning may be too advanced to retrospectively apply some initiatives. Regardless, this report aims to focus on the application of best practice ESD principles.

In accordance with the Landcom Sustainable Places Strategy use of 'best practice rating tools', the GBCA Green Star Communities National Framework guiding principles are adopted as indicators for the ESD framework assessment in this report.

2.3 Stakeholder Consultation

Collaboration brought about by the ESD process has sought to guide and influence technical disciplines through multidisciplinary workshops and meetings to provide a collaborative, best for project approach that meets stakeholder needs and expectations. This process has instigated refinement and clarification of the Bennett and Trimble Master Plan.

Disciplines particularly relevant to this ESD report include transport and traffic, utilities, stormwater, biodiversity, social infrastructure and urban planning. Whilst other disciplines are relevant, these disciplines are particularly important to developing a sustainable precinct in the context of the proposed master plan. These disciplines have been consulted and outcomes of these discussions included in the sustainability framework assessment in this report.

External stakeholder engagement was sought from Blacktown City Council at a meeting held on the 27th November 2017. The meeting presented Blacktown City Council with an opportunity to provide comment on the proposed master plan for consideration in this ESD report. Recommendations in this report have been developed to these council ambitions and the Area 20 DCP where feasible in the context of the proposed development.

2.4 Previous Studies

Other external stakeholder feedback pivotal to ESD outcomes has been sought from Area 20 technical reports including the *Area 20 Primary Utilities Report (2010)* which details feedback obtained from utilities providers Jemena, Telstra, Integral Energy and Sydney Water. This feedback is particularly important for the planning of major sustainability initiatives for Cudgegong Road Station Precinct South including the proposed precinct reticulated recycled water network.

Previous studies for the area include the North West Rail Link (now Sydney Metro) EIS and associated technical studies and design plans. It is important to refer to these reports not only for construction impacts but also for Cudgegong Road Station Precinct South's final design layout as the Operations, Trains and Systems (OTS) contractor is responsible for the design and construction of roadways through the precinct. The OTS contractor will leave vacant lots with removed vegetation offset and fauna managed in accordance with the EIS and NRT Flora and Fauna Management Plan.

2.5 ESD Framework Themes and Indicators

The following section provides an ESD framework that identifies and measures sustainability performance from the proposed development. It seeks to identify the complex interchangeable relationship between indicators that contribute to a sustainable and liveable development. This assessment takes in to account both the proposed precinct development impacts and broader Area 20 elements to ensure an integrated planning approach.

This framework has been developed to go above and beyond minimum requirements set in the SEARs, to include best practice principles outlined in the GBCA *Green Star Communities National Framework* and the Landcom *Sustainable Places Strategy*. Both frameworks have been adopted to evaluate a broad array of ESD factors and to demonstrate the ESD principles found in Section 2 of the *Protection of the Environment Administration Act 1991* have been met. A set of indicators have been developed to assess the proposed Master Plan ESD performance and provide recommendations to guide future planning, design, construction and operation of the precinct.

3.0 ESD Framework Assessment

Table 1 outlines integration of the GBCA Green Star Communities National Framework Assessment principles in master plan development and considerations for future planning and design development.

Table 1: Green Star Communities National Framework Assessment

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration
Enhance Liveability	Providing diverse and affordable living	• The Bennett and Trimble Urban Design aims to test height limits to ensure greater diversity in urban form, types and heights. The urban design has been altered from design directorate feedback to increase the range of housing types offered e.g. Maisonettes, terraces. • Provision for affordable housing included in master plan layout.	• Investigate options to provide dwellings without car parking and visitor spaces or 'separately titling' car parks within apartments to give residents a choice to reduce apartment costs and the cost of car ownership. • This concept proposal has a gross floor area of approximately 94,000m2. The concept design show an indicative yield of around 1,107 dwellings and around 9,155m2 of retail, commercial and community spaces. Within this yield there will be a requirement to provide a minimum 5% of rental Affordable Housing managed or owned by a Community Housing Provider. Future purchaser(s) of the sites are encouraged to deliver and/or enhance the targets and outcomes set out in the Landcom Housing Affordability and Diversity policy.

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration
	Creating healthy, safe and secure communities	• Bennett and Trimble Urban Design has focused on providing end to end visibility in streets. There is a mixture of local roads, arterial roads, cycle and pedestrian shared paths and pedestrian paths linking the proposed development and communities along Schofields Road to Cudgegong Station and Cudgegong Road Station Precinct South park and retail and commercial hub. • Healthy active living has been encouraged through the inclusion of a central precinct park. • Sports fields surrounding the precinct include Jonas Bradley Park and Peel Reserve Park. Future sports fields will be provided on Rouse Road as part of the development of the Cudgegong Road (Area 20) precinct.	• Consider provisions for further enhancement of active living within the precinct. This may include provision of a local gym within the proposed retail or commercial office space and/or outdoor gyms and recreational facilities in the Town Centre Park. • Provide sufficient road marking and signage to clearly indicate proposed cycle and pedestrian routes and directions to Cudgegong station and town centre. • Design roads and pavements to secure safe pedestrian and cycling crossing of major streets and road. • Design using CPTED principles to create safe and secure street access.
	Fostering inclusiveness and cohesiveness	• Features to promote inclusivity include the proposed park, retail, child care centre, library and multipurpose community centre within the Town Centre precinct. These will provide a number meeting points to enhance community relations. • Rouse hill shopping centre nearby, provides access to a range of retail and community facilities including a regional community centre.	• Create a community support group to address and tackle specific community issues as they arise. • Look to provide a number of meeting places for local residents to interact. Recommend to include café style outdoor seating around park area to activate Town Centre outdoor space.

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration
	Building community adaptability	• Opportunities for local employment will be present within the proposed retail and commercial centre. • 'Smart hub' office space including potential for co-working facilities identified. • Other regional employment opportunities are present with Rouse Hill Town Centre and Sydney Metro stabling yard nearby. Local connections to Bella Vista, Norwest and Castle Hill regional employment hubs also via Sydney Metro. • Shared precinct parking proposed between multiple units. • AECOM Utilities report outlines redundancy for future precinct expansion to the West (currently Sydney Metro car park).	• Provide diversity in retail space to provide a range of employment opportunities for all local residents. • Provide adaptive community spaces around the town centre and multipurpose community centre. Design of these spaces should be adaptive to provide a range of functions including recreational and community activities. • Plan for increased adoption of sustainable transport alternatives including bicycle sharing schemes, charging points for electric vehicles and parking for car share schemes.
Create opportunities for economic prosperity	Promote education and learning	• Revised master plan proposes child care centre and a local community centre within town centre precinct. • The Ponds High School, Riverbank Public School and The Ponds School are within approximately 1km of the proposed town centre precinct. • The Ponds School provides care for students with moderate or severe intellectual disabilities.	• Discuss provision of primary and high schools with DoE to identify current and future demand for schools in the local area. • Provide adult education classes at proposed local community centre and promote opportunities for further education and learning in surrounding precincts.
	Enhancing employment opportunities	• Opportunities for local employment will be present within the proposed retail and office space. • Precinct has good regional employment transport links with Cudgegong Station adjacent.	• Provide employment fairs/workshops at proposed local community spaces and promote both local and regional employment opportunities.

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration
	Attracting investment	• 3000 m^2 Commercial GFA and 4,500 m^2 Retail GFA will attract investment from wider region to Cudgegong Road Station Precinct South.	• Identify local community retail needs in relation to existing retail provided at Rouse Hill Town Centre to provide diversity and economic prosperity for the region.
	Encouraging innovation	• The Bennett and Trimble Urban design provides opportunities for innovative urban design particularly with the interface between the station and central park. • Commercial spaces to be defined in future design development.	• Encourage innovation in the selection of retail outlets to provide regional economic stimulus. • Encourage the selection of complementary commercial business to enhance prosperity and resilience of the precinct. • Look at opportunities to develop smart work hub to include business incubation and innovation program.
	Promoting efficiency and effectiveness	• Efficiencies in customer accessibility for retail spaces through public transport links. • Commercial and retail space and community services are located centrally to increase walkability for town centre residents. • Integrated town centre layout combines and enhances town centre functionality. This will create an attractive and economically prosperous town centre.	• Install energy and water efficient fixtures and fittings and apply the BASIX framework for energy and water use in residential buildings. BASIX: Detached: Energy 60, Three storeys: BASIX 45 6+ storeys: BASIX 40 targeted. • Provide metered parking around retail precinct to encourage quick and easy precinct access for shoppers travelling from outside the town centre precinct. • Develop a way finding strategy to encourage commuters travelling by foot from surrounding precincts and the Sydney Metro car park to pass through the town centre retail hub.

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration
Foster environmental responsibility	Enhancing our natural environment	• Proposed development situated in cleared lands. Majority of development work will be focussed in this area. • Drainage design seeks to reduce flow rates and water quality impacts on Second Ponds Creek through inclusion of a raingarden to capture and treat precinct stormwater flows.	• Enhance streetscape biodiversity through selection of native, low maintenance plant species. • Provide sufficient canopy coverage to cover 30% of streetscape. This will reduce impacts on urban heat island and microclimate. • Integrate WSUD features in to streetscape to further improve stormwater quality and flows and passive irrigation. • Conserve flora and fauna between Cudgegong Road and Second Ponds creek. • Prioritise use of permeable paving and/or high emittance/albedo paving (for low-rise &/or open areas).
	Reducing ecological footprint	• Recycled water is proposed to be provided to all buildings via a third pipe reducing reliance on potable water network. • Opportunities for stormwater capture and reuse for irrigation may be present in proposed raingardens. • Footprint predominantly confined to cleared Sydney Metro OTS area. • Master Plan identifies underground parking. This enables central waste collection and access. • Opportunities for sustainable transport routes are outlined in the Master Plan. Residential dwellings within walkable distance to Cudgegong Road Station Precinct South and station. • Opportunities to provide Photovoltaic (PV) systems will be dependent upon utilisation of roof space. Where roof terraces are installed, this will reduce the area available for PV units.	• Provide community information sessions to educate community members on individual and collaborative impacts of resource savings. • Provide water and energy efficient fixtures and fittings to meet BASIX requirements. • Confirm availability of recycled water network in line with forecast Sydney Water reservoir development (proposed 2020) *(Cardno, Area 20 Utilities Report , 2010).* As the Cudgegong Road Station Precinct South development is forecast for 2021, it is anticipated recycled water supply will be available upon construction completion. • Encourage uptake of walking and limit encroachment of Cudgegong Station parking by implementing on street parking restrictions. • Investigate opportunities to install PV systems on rooftops. Provide a balance between green roof space and PV installations to create green roof terraces and renewable energy alternatives. • Investigate the use of decentralised and distributed technologies including central thermal plants.

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration
Embrace Design Excellence	Adopting effective planning practices	• Cudgegong Road Station Precinct South layout optimised in planning. The Bennett and Trimble Urban design has sought to adapt the original master plan design to respond to design directorate feedback. This includes reducing block sizes, testing height limits to ensure greater diversity in urban form, types and heights, increasing the range of housing types offered, and exploring designated shared zones within streets.	• Enhance road layout and pedestrian and bicycle access in design to provide safe and reliable access through the precinct. Key to this will be the inclusion of pedestrian crossings along Precinct Street D. • Seek to prioritise the use of sustainable or recycled materials in building design and construction. This may include optimising use of FSC timber, supplementary cementitious materials and geopolymer concrete and recycled steel. • Investigate opportunities to provide green walls and roofs to enhance aesthetic appearance and reduce microclimate impacts.
	Encouraging integrated design	• The integration between the built environment and green space has been optimised through community garden areas within building blocks. • Central positioning of the central park will provide green space and a meeting place for precinct residents and station users. • Integrated commercial and retail space in the town centre will provide a range uses for those who use it.	• Prioritise timing of development construction to ensure sufficient amenities are in place and access is provided when the first residents arrive. • Optimise the civil infrastructure in the streets to maximise the ability of the public domain to provide deep soil planting for street trees and within parks.
	Maintaining flexible and adaptable approaches	• Adaptability and resilience are key with a view to the current station car park (outside of scope) potentially being upgraded/redeveloped with future with town centre expansion.	• Provide adaptability in design at the interface between the precinct and current station car park site. This includes options for future tie ins with Town Centre streetscape and utilities. By providing easily accessible utility connections along the Western boundary this may mitigate the need for future disruption and road works. • Provide contingency in utilities for predicted future precinct expansion.

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration
	Creating desirable places	• Aesthetic appeal of the town centre is characterised by the central park. • Vegetation proposed as per Clouston landscape design seeks to provide plant and tree beds to enhance precinct appearance.	• Provide a buffer between the station car park and the proposed Town Centre using tree planting. This will seek to improve the aesthetic appearance of the car park for town centre residents and provide shading. • Seek to use sustainable materials including FSC timber in building design. This will act to soften building appearance and can substitute traditional materials including steel and concrete.
	Promoting accessibility	• Bennett and Trimble urban structure design illustrates cycle/pedestrian shared paths. This includes cycle ways along Cudgegong Road and pedestrian links from the metro station to Schofields Road consistent with Figure 3-3 and 4-4 of Schedule 4 of the Cudgegong Road DCP.). These routes will connect cyclists to the main East to West shared paths on Schofields Road and Rouse Road • Collector roads (Themeda and Conferta Avenue) include shared pedestrian and cycle access • Direct precinct road access available to North, South, East and West.	• Provide pedestrian access linking the metro station car park, to the site and Metro Station. Aim to encourage commuter foot fall from the metro car park through the precinct to boost local retail. • Install pedestrian crossings across Conferta Avenue to connect the two halves of the precinct, increase walkability, reduce vehicle speeds and increase pedestrian safety. These should be positioned along North to South active transport corridors. • Seek to provide designated cycle lanes in areas of high pedestrian use to reduce bicycle and pedestrian user conflict. This is particularly relevant directly opposite the retail area along the Western edge of the central park.

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration

Demonstrate visionary leadership and strong governance	Establish coordinated and transparent approaches	• Bennett and Trimble Master Plan has sought to respond to residential needs through integration of retail, community services and recreation.
		• The Ponds and Kellyville Ridge Community Association established for neighbouring developments aims to:
		  ○ provide events and facilities to bring our community together
		  ○ present community issues to relevant authorities
		  ○ pursue community objectives
		  ○ keep you informed about important community information
		  ○ keep our community a wonderful an safe place to live
			• Create a community support group to address and tackle specific community issues as they arise.
			• Recommend to establish a community association with similar aims to those seen at The Ponds and Kellyville Ridge Community Association.

	Build a commitment to implementation	• The Bennett and Trimble Master Plan, this report and other technical reports demonstrate a commitment to sustainable development. Master plan development has sought to identify and evaluate feasible options for implementation.	• Recommendations made in this report include those for detailed design and construction consideration. It is recommended these guide future design consideration and are adopted as commitments where feasible.
	Engaging with stakeholders	• Blacktown Council engaged as part of master plan development (feedback included in Appendix A). • Utility providers consulted as part of Area 20 primary utilities report (Cardno, 2010).	• Seek to engage with neighbouring community groups and schools through planning and design development. Engage neighbouring community members to establish safe access through the site.
	Fostering sustainable cultures and behaviours	• This framework aims to assist in guiding sustainable cultural and behavioural outcomes.	• Consider promoting the sustainable credentials of the precinct to educate community members and enhance uptake of community initiatives.

Theme	Principle	Master Plan Implications	Recommendations for Future Consideration
	Encouraging and rewarding innovation	• Innovation and enhancement of the original master plan has been sought through the redistribution of yield. Option B provides plans for a larger central park through removal of an adjacent building. Final option for adoption tbc.	• Identify innovations in design development and operation through consultation with relevant stakeholders.

Table 2 outlines integration of the Landcom Sustainable Places Strategy targets in master plan development and considerations for future planning and design development.

Table 2: Landcom Sustainable Places Strategy Targets

Indicator	Objective	Target	Master Plan Implications	Recommendations for Future Consideration
Climate Resilient Places				
Environmental Management	To maintain and enhance a culture of high environmental performance	• All projects will adopt the use industry recognised rating tools at a master plan and built form scale, achieving not less than 'Australian Best Practice' equivalent.	• The GBCA Green Star Communities National Framework Principles have been adopted and applied to Master Plan development and guidance in this report.	• The GBCA Green Star Communities National Framework Principles will be adopted for the ESD precinct Master Plan. It is recommended that the development targets a minimum 5 Star GBCA Green star Communities rating. • Using the guidance and findings from this report, it is recommended Cudgegong Road Station Precinct South targets a minimum 5 Star GBCA Green Star Communities rating.
		• NABERS: Office, Hotel and Retail- Commitment Agreement or designed to 5 Star Energy and Water. • BASIX: Detached: Energy 60, Three storeys: BASIX 45 6+ storeys: BASIX 40	• NABERS minimum 5 Star Energy and Water targeted. • BASIX: Detached: Energy 60, Three storeys: BASIX 45 6+ storeys: BASIX 40 targeted	• NABERS minimum 5 Star Energy and Water targeted. Recommend this target is included in developers' requirements. • BASIX: Detached: Energy 60, Three storeys: BASIX 45 6+ storeys: BASIX 40 targeted. Recommend this target is included in developers requirements.

Indicator	Objective	Target	Master Plan Implications	Recommendations for Future Consideration
Water	To design our precincts based on best practice water sensitive urban design principles, and actively conserve potable water	• All projects to embed Water Sensitive Urban Design or other water sensitive strategies to reduce stormwater pollutant loads to minimise discharge from project sites.	• Results of MUSIC and DRAINS modelling provided in drainage report. • Raingarden proposed for the Eastern side of the site • WSUD features proposed. Refer to AECOM drainage report.	• Recommend to include WSUD features within the proposed precinct. These features should be designed and sized accordingly on modelled water quality parameters and are particularly important where stormwater flows bypass raingardens on the Southern perimeter. Refer to AECOM Drainage report.
		• All new projects modelled to reduce mains potable water demand by 50% at the precinct scale, against a 2016 reference case.	• Reticulated recycled water network coupled with efficient fixtures should meet >50% mains potable water demand reduction (subject to design modelling). Recycled water use anticipated to make up the following total water use proportions: Toilet 26%, Laundry 23%, Outdoor 40% (Your Home, 2017).	• Include Landcom BASIX targets as part of developer's requirements to drive installation of water efficient building fixtures and fittings. • Demonstrate compliance against targeted Landcom BASIX water targets in design. Model anticipated water balance and efficiencies.

Indicator	Objective	Target	Master Plan Implications	Recommendations for Future Consideration
Energy & Emissions	To conserve energy and drive energy efficient, low carbon, low emissions precincts for the future	• All new projects modelled to reduce Green House Gas (GHG) emissions at a precinct scale (transport and stationary) by 50% against a 2016 reference case. • 5% of predicted precinct energy demand supplied from onsite renewable energy, where site constraints permit	• Provision of roof space identified for roof top solar to achieve precinct scale GHG emissions reductions. It is predicted the precinct will meet a 50% reduction target with access to the new metro (significantly reducing car dependency). This is forecast to be powered by 100% renewable sources. • On-site Photovoltaic (PV) arrays anticipated to make up >5% electricity demand annually. • Building orientation adjusted during planning to promote thermal efficiencies. Focus has been on reducing solar exposure at West facing building at 'Site 3A' and reducing heat from adjacent Cudgegong Station car parking.	• Recommended installation of rooftop PV systems. These should be modelled against anticipated energy demand to confirm a minimum of 5% of total energy demand is provided through renewable means. • Include Landcom BASIX targets as part of developer's requirements to drive energy efficient building fixtures and fittings with developer. • Demonstrate compliance against targeted Landcom BASIX energy targets in design. Model anticipated water balance and efficiencies. • Buildings to comply with Section J requirements and SEPP 65 (Better Apartments). • Central thermal plants unlikely to be suitable for residential buildings due to fluctuations in demand. Investigate opportunities to include central thermal plants/ technologies in mixed use buildings (retail and residential). • Sustainable transport options including electrical vehicle charging stations and car and bicycle share schemes recommended. • Design for cross flow ventilation to reduce energy use associated with air conditioning. • Provide passive thermal building efficiencies through orientation toward solar North or through external building shading.

Indicator	Objective	Target	Master Plan Implications	Recommendations for Future Consideration
Climate & Resilience	To respect, conserve and regenerate our natural environment and embed adaptation and resilience into all precincts, and expand community awareness	• All new projects to prepare and implement an effective Climate Change Adaptation Plan; and Community Resilience Plan with measurable outputs	• Bennett and Trimble urban design plan and technical studies informed by existing climate change studies undertaken by Sydney Metro, NRT.	• Recommend to undertake a climate change and community resilience plan highlighting resilience to future environmental and social changes and pressures. Refer to existing Sydney Metro studies undertaken by NRT for consistency.
		• All new projects enhance the local habitat, biodiversity or ecological communities, compared to the site conditions pre-acquisition or pre-masterplan (as relevant)	• Cudgegong Road Station Precinct South precinct previously cleared by Sydney Metro NRT package. Impacts to biodiversity and offsetting have been managed in accordance with Sydney Metro plans and EIS. • Landscape architects have sought to prioritise native species selection and optimise biodiversity within the proposed development. Refer to Clouston Associates Landscape Concept Design report.	• Seek to provide a minimum of 30% street canopy cover. • Prioritise low maintenance, native species selection. • Combine WSUD and ecological benefits where feasible e.g. tree pits capturing stormwater runoff for irrigation.

Indicator	Objective	Target	Master Plan Implications	Recommendations for Future Consideration
		• All new Master Planned communities to align with the Greater Sydney Commission District Plans' objectives for enhancing the Green Grid, by achieving the below percentage of total project site area in plan view comprised of building or landscape elements that reduce the impact of urban heat island effect. ○ Greenfield Projects: 50% project site area ○ Renewal or High Density Projects: 20-50% project site area	• Precinct defined as a 'high density project' (20-50% project site area targeted). Planning development has sought to provide options to expand the size of the central park (from 2,900 to 5,000m2) through removal of buildings initially proposed. Community gardens and communal areas proposed between apartment blocks.	• Seek to provide dense canopy coverage opposite West facing buildings to increase building thermal efficiency. • Optimise the use of available roof space and reduce microclimate impacts through rooftop gardens.
Waste & Materials	To drive innovation in waste reduction, and further enable the use of responsible resources	• All new projects divert minimum 95% construction waste from landfill (excl. contamination or hazardous materials)		• Recommend for 95% waste diversion target informs developer's requirements.
		• 100% timber sourced for construction (by weight) is Forest Stewardship Council Certified or agreed equivalent (i.e. Australian Forestry Standards)		• Recommend 100% FSC timber target informs developer's requirements.
Healthy & Inclusive Places				
Community Connection	To nurture wellbeing and connection for all that live, work and recreate in our communities	• Arts, culture and local heritage will be embedded into the creation of all new projects, integrating and building on the existing character of the place	• Opportunities are identified for heritage interpretation in the retail area including in the central park. • Community spaces identified to promote heritage values, arts and culture of local area.	• Preserve and enhance local community values (including aboriginal values) through community events and classes. • Use community spaces to promote heritage values, arts and culture of local area.

Indicator	Objective	Target	Master Plan Implications	Recommendations for Future Consideration
		• Foster the integration of existing community networks and shared community facilities into our projects, and build upon these to enhance the benefit to residents and workers at our projects (existing and future)	• Bennett and Trimble urban design has sought to provide public space along key pedestrian and cycle routes to enable access by all users. • Community uses are strategically located opposite the central park and retail to provide an activated and integrated Town Centre core.	• Add requirements around inclusion of community uses. Sizing, access and features will require discussion with Blacktown Council and local community groups. • Provide opportunities for local employment through hosting employment workshops/fairs at proposed community centre.
Safety & Wellbeing	To promote a culture of health, safety and wellbeing	• Drive a culture and priority of safety throughout our organisation and on all Landcom projects, striving to achieve incident and injury free environments for overall wellbeing	• Accessibility in public space has been planned in urban and landscape design. This provides safe, compliant access ramp solutions to lessen the gradient of pedestrian paths through the central park. Refer to Coulston Landscape Concept Design. • Pedestrian cycle and vehicle route selection has sought to mitigate conflict between pedestrians, cyclists and road vehicles. Traffic assessment identified the need for a pedestrian crossings across the central Conferta Avenue.	• Separate pedestrians and cyclists by providing designated cycle lanes in areas of high pedestrian activity. Recommend adoption of designated cycle lane along the Western edge of the park. • Identify provision for recreational activities and kids play areas within the proposed park based on community needs. • Install traffic management measures to discourage Sydney Metro car park users away from driving though the heart of the precinct. Encourage use of other access roads including Tallawong Road. This reduced traffic flow will increase safety for community members within the Town Centre precinct. • Ensure end to end street visibility for pedestrians and vehicles when designing streetscapes surrounding the park.
Design through engagement	To optimise the quality of design and place for our communities To drive strong	• All new projects to undergo peer review through the Design Directorate, or equivalent Design Review Panel	• Bennett and Trimble Urban Design Plan developed to respond to design directorate feedback.	• Review final design against the recommendations outlined in this report to ensure uptake of initiatives.

Indicator	Objective	Target	Master Plan Implications	Recommendations for Future Consideration
	engagement with our communities and stakeholders	• All new projects to conform with the community engagement policy, Join-In Protocol, aligned to industry best practice for stakeholder engagement practice.	• Feedback on proposed Master Plan and ESD initiatives obtained from Blacktown Council.	• Engage and involve local community groups in the development of Town Centre public spaces and the local community centre. • Establish a local community group to identify and discuss community initiatives.
Health, Equity & Inclusion	To create healthy, equitable, and inclusive outcomes for all members of our communities	• All new projects to foster healthy built environment objectives of getting active, socialising and eating well through design-led interventions and/or services	• The framework included in this ESD report. • Urban design seeks to provide healthy active places in the central park area. This area provides a number of meeting, social and activity spaces with a community centre adjacent. The master plan proposes a mix of retail, recreation and community services including child care in the precinct core.	• Further investigate and address community needs in precinct design in consultation with local community groups and Blacktown Council. • Explore opportunities to enhance the interface between retail and the town centre park- this may include outdoor seating for restaurants and coffee shops.
		• All new projects are designed and delivered to achieve high quality public, active and sustainable transport options to key amenities, services, public transport and employment	• Master Plan seeks to meet a 'Walkers Paradise' and Riders Paradise' score due to proximity of Town Centre facilities and Metro station to proposed residential developments. • Provide signage to inform of bicycle and pedestrian routes throughout the precinct.	• Analyse and update regional pedestrian links surrounding the precinct including the crossing Schofields road to improve access to surrounding community facilities and schools. • Install pedestrian and cycle route signage to encourage adoption of active transport.

Indicator	Objective	Target	Master Plan Implications	Recommendations for Future Consideration
		• Deliver 5-10% of new homes as Affordable Housing, across each project, in line with government policy	• Proposed precinct development options will include a mixture between 1 bed (30%), 2 bed (55%) and 3 (15%) bed apartment blocks. • Provision of affordable housing is central to the proposed master plan.	• This concept proposal has a gross floor area of approximately 94,000m2. The concept design show an indicative yield of around 1,107 dwellings and around 9,155m2 of retail, commercial and community spaces. Within this yield there will be a requirement to provide a minimum 5% of rental Affordable Housing managed by a Community Housing Provider. Future purchaser(s) of the sites are encouraged to deliver and/or enhance the targets and outcomes set out in the Landcom Housing Affordability and Diversity policy.
		• 20% of medium to high density dwellings within all new projects are 'Design' and 'As-Built', Liveable Housing Australia Silver Certified (in addition to any State Environmental Planning Policy or legislative req.)	• Compliant options to be clarified further in detailed design.	• Achieve a minimum 'Design' and 'As-Built', Liveable Housing Australia Silver Certified for 20% of precinct apartments. Recommend this target informs developer's requirements.

4.0 Delivery Strategy

4.1 Establishing a Governance Framework

To facilitate the delivery of recommended sustainability initiatives, it is important for an effective governance framework and process of continual review to provide a best for project approach that delivers optimal sustainability outcomes. Key to this is the identification of stakeholders whose role it will be to check for regulatory compliance and development in line with best practice principles and targets as stipulated in the Landcom Sustainable Places Strategy.

It is anticipated for recommendations and targets specified in this report to inform developer(s) requirements. The targets provided in Section 5.0will underpin minimum sustainability performance on the project, with those provided in Section 6.0 set as aspirational targets.

Many of the recommendations provided in this report, particularly those relating to building energy and water use, are yet defined and will require consideration by developers in design development. Where this is the case, this report has sought to prescribe minimum compliance targets or recommend adoption of sustainability frameworks to ensure adoption of initiatives. This includes achieving a recommended minimum compliance of **Five Star for Green Star Communities**, **'Silver' Liveable Housing Australia for 'Design' and 'As-Built'** for 20% of residential apartments and **BASIX targets** as specified in the Landcom Sustainable Places Strategy.

Green Star Communities provides a governance framework that is transparent, accountable and adaptable and it is recommended this is adopted to inform decision making and design development. The governance category rewards projects that achieve coordinated and transparent approaches, commitment to implementation, stakeholder engagement and sustainable cultures and behaviours.

4.2 Precinct Construction Staging

Staging of construction will be important to mitigate environmental and social impacts and ensure provision of amenities when the first residents move in to the precinct. It is recommended the Cudgegong Road Station Precinct South is developed from the centre-out (from the area closest to Cudgegong station) to provide social amenities including access to community services and recreation. Phasing development in this way will also act to reduce the risk of sediment laden water runoff as an existing basin in the South-East corner of the project can be used to capture and treat runoff up until the final stages of construction when the majority of the precinct will have been built and permanent stormwater infrastructure installed.

As discussed in this report, access to the recycled water network will be dependent upon Sydney Water adding capacity to its existing Rouse Hill network through installation of a nearby recycled water reservoir. Regardless of potential alterations in timings for the new reservoir, precinct buildings are planned to incorporate third pipes and recycled water fittings from initial fit out.

Whilst access to areas of the precinct will be blocked during construction, it will be important to maintain access to core services including the metro station during this time.

4.3 Green Star Communities

The Green Star Communities V1.1 tool evaluates the sustainability attributes of the planning, design and construction of large scale development projects, at a precinct scale (GBCA, 2016). It drives and measures performance of social, environmental and economic outcomes through the following categories:

- Governance
- Liveability
- Economic Prosperity
- Environment; and
- Innovation.

A targeted minimum Five Star Green Star is representative of **'Australian Excellence'** standard. Minimum category scores for Five Star achievement of each category are provided in Table 3.

Table 3: Green Star Communities Minimum Five Star Requirements

Rating	Minimum Total Score	Minimum Category Score				Outcome
		GOV	LIV	ECON	ENV	
Five Star	60-74	6	4	4	6	Australian Excellence

The Green Star Communities submission guidelines provide details of credit aims and criteria and background information and resources. It is recommended for the awarded developer(s) to register with the GBCA for Green Star Communities soon after engagement to integrate requirements in to Cudgegong Road Station Precinct South design.

5.0 Cudgegong Road Station Precinct South Targets

The following overarching minimum compliance targets have been identified as key to furthering sustainable precinct development outcomes in Cudgegong Road Station Precinct South. These have been adapted from and are consistent with the Landcom *Sustainable Places Strategy* with some additional key targets for heightened performance. Whilst all targets outlined in the Sustainable Places Strategy will be targeted for Cudgegong Road Station Precinct South (as highlighted in Section 3), these are identified as particularly important to achieving desired outcomes.

Targets provided in this section aim to meet the ESD objectives and controls stipulated in the Area 20 DCP (Section 6.5) with the exception of:

- *Roof stormwater collection*- This will only be required for buildings not connected to the proposed Sydney Water recycled water 'third pipe' network.
- *New Commercial buildings must achieve a minimum 4 star Green Star rating from the Green Building Council of Australia. Refer to the Green Star- Office As Built v3 Technical Manual.* – The Green Star- Office rating tool was discontinued as of 31 December 2015.
- *New industrial and light industrial buildings must achieve a minimum 4 star Green Star rating from the Green Building Council of Australia for such time that an Industrial Tool has been adopted*- No industrial buildings are proposed for Cudgegong Road Station Precinct South.

Table 4: Cudgegong Road Station Precinct South Targets

Theme	Sub-Theme	Target
Energy & Water	NABERS (Office, hotel & retail)	Commitment Agreement to 5 Star Energy and Water
	BASIX (Residential)	BASIX Energy- Detached & Semi- 60, Low-Rise- 45; Mid-Rise: 45, High Rise 40 Water- All dwellings- 60
	GHG Emissions	Reduce Greenhouse Gas (GHG) emissions at a precinct scale (transport and stationary) by 50% against 2016 Sydney Metro averages as a reference case. For example, baseline emissions estimated in Precinx for sites 2,3,4 and 5,(based on estimated population of 2724, total dwellings of 1508, non-residential area of 16,333m^2 and public domain of 0.9ha) are 14,300 tCO_2-e/year (residential emissions 6,428 tCO_2-e-year, non-residential emissions 3,241 tCO-$_2$-e/year, transport emissions from resident vehicles 4,631 tCO_2-e/year). NB, equivalent calculations are permissible to demonstrate % reduction if Precinx is not being used.
	Water reduction	Reduce potable water consumption by 50% against Sydney Metro averages as a reference case. Sydney Metro Average as per Precinx is residential 237 ML/year, non-residential 14 ML/year. These figures are based on the broader scheme (sites 2, 3, 4, 5) but can be normalised per person, per dwelling, for residential/non-residential for the purposes of demonstrating reduction against this target.
	Renewable Energy	Provide 5% of predicted precinct energy demand supplied from onsite renewable energy, where site constraints permit.

Theme	Sub-Theme	Target
	Urban Heat Island Effect	Reduce urban heat island effect by providing a minimum of 20% tree canopy cover in streetscapes that reduces urban heat island effects.
Construction	Waste and Materials	Divert a minimum 95% of construction waste from landfill
		Source 100% of timber from Forest Stewardship Council Certified or agreed equivalent (i.e. Australian Forestry Standards)
Community	Community Connection	Integrate existing community networks and shared networks (e.g. Ponds and Kellyville Ridge Community Association) and build upon these.
	Safety	Embed safety in design through review of building features and streetscape design.
	Green Star Community	Achieve a minimum Five Star GBCA Green Star Communities rating.
Health, Equity & Inclusion	Affordable Homes	Provide a minimum of 5% precinct affordable housing.
	Liveable Housing Australia	A minimum of 20% of precinct dwellings achieve ‘Design and ‘As-Built’ Liveable Housing Australia ‘Silver’ certification.
Transport	Electric vehicles	Seek to provide a minimum of 10% parking yield electric vehicle charging per parking lot.
Training and Employment	Providing Jobs	Provide employment opportunities in the form of retail and commercial office space. Develop a ‘smart hub’ with the aim of providing start up and small businesses with opportunities to operate within the precinct.

6.0 Aspirational Targets

In line with the Landcom vision to “deliver world class sustainability across our portfolio” (Landcom 2017), this section identifies a number of stretch targets to promote adoption of best practice sustainability in Cudgegong Road Station Precinct South. These are anticipated for use as a guide to prospective developers for consideration in tender response. These aspirational targets should be read in conjunction with the recommendations in Section 3.0 of this report to meet these.

Table 5: Cudgegong Road Station Precinct South Aspirational Targets

Theme	Sub-Theme	Potential Target
Energy & Water	NABERS (Office, hotel & retail)	Designed to 5 Star Energy and Water
	Green Star	Achieve a minimum Four Star Green Star Design and As-Built for approximately 20% of precinct buildings.
	Renewable Energy	Demonstrate that the use of on-site renewable energy or on-site generation sources reduces the peak electricity demand by at least 15% in accordance with Green Star Design and As-Built v1.2.
	Climate Change	Mitigate 50% of medium and all high and extreme climate change risks.
	Urban Heat Island Effect	Reduce urban heat island effect by providing a minimum of 30% tree canopy cover in streetscapes that reduces urban heat island effects. Use high albedo roofing and pavement to increase solar reflectivity or green roof space to meet Design and As-Built Green Star V1.2.
	Thermal Comfort	Meet ‘advanced thermal comfort’ requirements as outlined in Green Star Design and As-Built v1.2.
Construction	Materials	Prioritise the use of sustainable building materials including use of sustainable timber and materials with recycled content/sustainable material substitutes. Prioritise the use of locally procured materials in construction. Demonstrate optimisation of embodied energy reductions in materials.
Community	Green Star Communities	Achieve a Six Star GBCA Green Star Communities rating.
	Design through engagement	Conform to the Landcom *Join-in Protocol* and seek community feedback for public space design.
Health, Equity & Inclusion	Recreation	Identify and provide community health and well-being initiatives and facilities and provide education to residents to promote initiatives adoption.
	Sustainable transport	Meet the performance or prescriptive pathway requirements of the Green Star Design and As-Built rating.
Training and Employment	Providing jobs and training	Facilitate local employment and education fairs to promote further learning and apprenticeships and provide local employment opportunities.

7.0 Focus Areas & Opportunities

This section provides an in depth look at the key ESD focus areas identified during planning for Cudgegong Road Station Precinct South. This aims to identify opportunities and initiatives for developers to investigate in the future.

7.1 Urban Heat Island Effect

Reducing urban heat island effect is a particular issue for Western Sydney with the number of days over 35°C having increased by 250% since 1965 compared with only a 22% increase in central Sydney (*Guide to Urban Cooling Strategies* Low Carbon CRC, 2017). Urban heat island and microclimate impacts typically occur when urban surfaces such as roads and roofs hold and reradiate heat, raising the temperature of their surroundings.

The draft strategic plan for addressing extreme heat in Western Sydney 2018-2023 coordinated by Western Sydney Regional Organisational Councils will be shortly available and it is recommended these findings of this report are adopted for design of Cudgegong precinct.

The low carbon living CRC Guide to Urban Cooling Strategies 2017 provides an 'Urban Cooling Toolkit' and includes guidance on shading, paving and urban vegetation. It is recommended this is referred to for streetscape design.

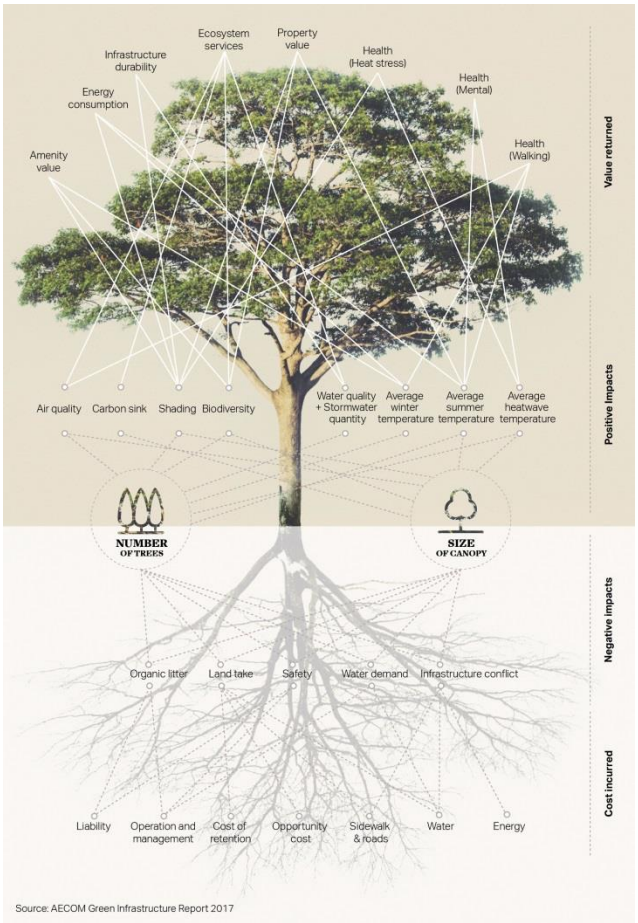

Figure 4: Tree Benefits and Impacts, AECOM 2017

The diagram above illustrates the complex relationship between the number of trees and size of canopy and the social, environmental or economic benefits and impacts. Benefits and impacts have been assessed and measures to reduce impacts and promote benefits considered in planning. These

considerations include tree species selection, planting location and environmental, social and economic influence.

Reducing urban heat island impacts using the treatment suggested in this section will be particularly important to counter the effects of the adjacent Sydney Metro commuter car park. Proposed landscaping along the Eastern edge of the development is arranged to provide a buffer to adjacent car park heat radiation and shading for neighbouring buildings. Street trees species, quantity and locations will be designed to maximise canopy coverage. Refer the Clouston Landscape Report for more information.

7.2 Water Cycle Management

Planning has sought to implement total water cycle management by including measures that reduce consumption of potable water for non-potable uses, minimise stormwater run-off and promote stormwater re-use in accordance with the Area 20 DCP.

Key to achievement of reductions in potable water use will be the proposed Sydney water recycled water network and water efficient fitting and fixtures (AAA rated) to meet identified BASIX targets.

Capture, treatment and discharge using WSUD and raingardens will manage and treat stormwater runoff prior to discharge. Where drainage functional requirements allow, stormwater will be diverted for the purposes of precinct irrigation. Refer to the AECOM Stormwater Management Report for further details.

Species selection will be key to alleviating the need for intensive irrigation across the precinct. Further details of proposed landscaping can be found in the Clouston Landscape Report.

7.3 Sustainable Transport, Accessibility & Community Interaction

Planned transport links through the corridor have sought to provide road access from neighbouring suburbs to Sydney Metro car parking and town centre parking, and provide safe access for cyclists and pedestrians through the precinct.

Planning development identified a need to divert commuter traffic around the town centre precinct where possible and slow traffic flow through Precinct Road D. Diversion of vehicles will also improve air quality for local residents with the town centre. Safety for pedestrians and cyclists across Precinct Road D has been identified as a priority and pedestrian crossings identified.

Road layout and parking restrictions have sought to restrict street parking and prioritise adoption of sustainable alternatives. To aid the uptake of active transport it is recommended car share and cycle hire schemes are provided.

Urban design has sought to create a vibrant, liveable and accessible town centre for all ages. Planning of the central park at the heart of the town centre aims to enhance walkability for local residents whilst providing access for station commuters. Wide footpaths around the park and community gardens provide opportunities for central meeting places and for open front retail. Park design has sought to provide safe access by mitigating the need for some stairwells and decreasing the gradient of pathways using diagonal pathways, whilst still providing more direct station and retail access for cyclists and pedestrians around the park perimeter.

Smaller community gardens and wide public spaces have been included between residential blocks to create open, secure community spaces. This is highlighted in the Bennett and Trimble Urban design plan.

7.4 Precinct & Building Energy Efficiency

Passive design measures included in precinct planning level have aimed to reduce energy burden to achieve thermal comfort levels. Measures identified include addition of green space, maximisation of tree canopy coverage, use of façade shading including louvres and use of natural ventilation. At a building specific level it is expected for the developer to identify specific energy saving measures including high performing building insulation and materials, energy efficient air conditioning and installation of high energy rated appliances.

7.5 Renewable Energy

Design has sought to prioritise on-site renewable energy generation using roof mounted photovoltaic arrays. Sizing of these arrays should meet renewable energy targets identified in Section 6 and aim to provide redundancy in the event of a grid power outage. It is suggested to maximise rooftop PV panel installation and use to maximise renewable energy generation for the precinct. If renewable supply outweighs precinct demand, it is suggested in the first instance to investigate the use of battery cells to provide precinct renewable energy use at night and/or feeding renewable energy back in to the grid.

Whilst solar has been identified as the primary renewable resource, opportunities may be present to generate electricity using wind power and use geothermal heat pumps to the reduce energy burden on maintaining precinct and building thermal comfort. The exact sustainability benefits of installing these technologies will need further examination in the precinct context including evaluation of space available and feasibility to operate and maintain.

8.0 Conclusion

This report provides discussion on the implications of the Bennett and Trimble Concept Plan for Cudgegong Road Station Precinct South and its ability to meet best practice ESD principles. The assessment meets the intent of proposed SEARs, relevant SEPPs and Bankstown Council Area 20 DCP using an assessment framework with indicators informed by the GBCA Green Star Communities National Framework and Landcom Sustainable Places Strategy.

The assessment and subsequent discussion on relevant focus areas outlines planning considerations and justification on preferred options. The assessment also delivers a detailed set of recommendations for further planning, design and construction guidance. This includes social sustainability measures including provision of affordable dwellings and greater dwelling diversity, and environmental sustainability measures including use of the Sydney Water recycled water network. Focus areas have been highlighted and discussed in detail including urban heat island effect mitigation, water cycle management and sustainable transport, accessibility and community interaction.

The identified minimum targets in Section 5.0 detail the overarching requirements for Cudgegong Road Station Precinct South to unpin delivery of initiatives identified in Section 4.0. Section 6.0 provides further aspirational targets, acting to guide future developers, inform tenders and further enhance ESD outcomes. These have not been mandated to allow for further evaluation of practical solutions and flexibility in design development.

Overall this report concludes the proposed Cudgegong Road Station Precinct South will;

a. provide a sustainable and liveable development based on the preferred Bennett and Trimble urban design coupled with adoption of initiatives and targets in this identified in this report.

b. meet (in conjunction with this report and referenced reports) the ESD planning controls and requirements for the purpose of gaining project planning approval.

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