Taronga Zoo Reptile and Amphibian Conservation Centre 08/07/2021

Environmentally Sustainable Design Strategy

Prepared for

Taronga Conservation Society Australia

Revision 02

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Revision Information

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Contents

1 Introduction

This Report has been prepared by LCI for the Taronga Conservation Society Australia (TCSA). This Report provides an overview of the Ecological Sustainable Design initiatives considered for the new Reptile and Amphibian Centre, and to address the Requirement 7 (Ecologically Sustainable Development (ESD) and Climate Change) of the Secretary's Environmental Assessment Requirements (SEARs). This report will be included within the Environmental Impact Statement (EIS) that will accompany a State Significant Development Application (SSDA).

This SSDA is for the construction of a new Reptile and Amphibian Centre. TCSA is proposing the demolition of the existing Reptile Exhibit via a separate SSDA (Taronga Wildlife Hospital). The new precinct will inspire excitement, encourage visitation, provide opportunities for connection and reflection and facilitate learning experiences to think about our everyday lives and behaviours that impact the conservation of wildlife.

Figure 1: Regional Context (Source: Urbis)

2 Site Description

2.1 The Site

Taronga Zoo is located at Bradleys Head Road, Mosman and is situated in the Mosman Local Government area (LGA). The site is bounded by Bradleys Head Road to the east, Athol Wharf Road and Sydney Harbour to the south, Little Sirius Cove to the west and Whiting Beach Road to the north. Taronga Zoo is legally described as Lot 22 on DP843294 and is Crown Land managed by the TCSA (the Zoological Park Board).

3 Overview of Proposed Development

3.1 RACC Facility

The proposed location for the RACC is within the middle of the site adjacent to a range of animal exhibits including camels, capybaras and gorillas and the forest adventure playground. The site previously housed the Seal show amphitheatre and is now largely cleared with astroturf and replanted vegetation. A temporary meerkat exhibition is also located within the site which will be demolished and the meerkats relocated into the approved African Savannah Precinct shortly. These works will be undertaken as exempt development as per Schedule 2 of Mosman LEP 2012 if they have a Capital Investment Value (CIV) of less than $1 million. The RACC will house animals which are to be relocated from the current Serpentaria location which is proposed for removal under a separate SSDA. A Site Location Map is provided below.

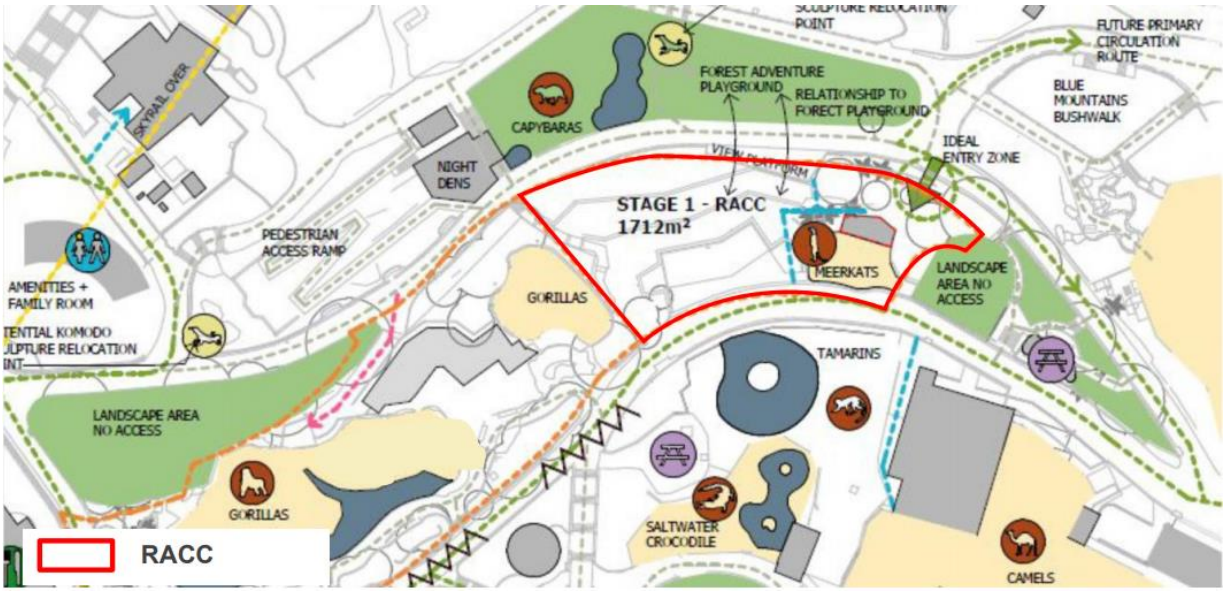

Figure 2: Site Location Map

3.2 Project Description

The proposed works will provide a new animal exhibit known as the Reptile and Amphibian Conservation Centre (RACC). The existing reptiles and amphibians will be relocated from their current location to a newly developed exhibit and experience for Taronga Zoo's guests. The new Centre will inspire excitement, encourage visitation, provide opportunities for connection and reflection, and facilitate learning experiences to think about our everyday lives and behaviours that impact the conservation of wildlife. The new facility will:

- Provide contemporary messages and call to action related to Reptile and Amphibian conservation.
- Create exciting, inspiring and compelling experiences that meet guest expectations, encourage revisitation and contribute to the financial sustainability of Taronga.
- Includes guest experience, keeper talks, encounters and tours.
- Improve positive animal welfare outcomes for the animals in our care.
- Showcase Taronga's relevant conservation recovery programs.
- Highlight culture and Indigenous communities and the role these animals play to these communities.
- Develop a built asset that considers sustainability, mature asset management principles and integrated asset systems e.g. fire, heating, ventilation, and air conditioning to ensure sustainable maintenance outcomes for asset lifecycle.

Overview of the Proposed Development:

Project Area	1,712sqm
Site Preparation	Preparation works including animal relocations to temporary facilities and demolition of the temporary meerkat exhibition can be undertaken by the Zoo as exempt works, as per Schedule 2 of Mosman LEP 2012 if they have a CIV of less than $1 million, prior to the determination of any application.
Construction Summary and Timing	It is anticipated early works and site preparation will begin in second half of 2021 (pending timely development approval) with main works beginning early 2022 based on a 30 month construction and design program.
Built Form	The proposal will provide a two storey building with a new forecourt and entrance along the eastern entrance to the site with: - Ground floor: BOH/staff facilities including food prep and holding facilities accessible from the current ground entrance. - First Floor: Exhibition spaces accessible via the new main entrance adjacent to the forest adventure playground to the north of the site. - Rooftop: Additional exhibition space accessible from the forecourt with a roof canopy to reflect natural conditions for animals including Komodo Dragons. An architectural wall is proposed along the southern façade of the building to provide screening and reflect the camouflage abilities of many of the animals on display. This feature will also ensure that the built form is not highly visible from Sydney Harbour
Access and Parking	Access to the building will be available from existing walkways to the north and south of the proposed site, with minor changes proposed to the heritage walking pathways. Public access will only be available from the eastern entrance and forecourt with staff access proposed from the current ground level along the southern walkway. No changes are proposed to existing parking and loading arrangements for the Zoo.
Hours of Operation	The proposal will operate within the existing hours of operation for the zoo.
Signage	Wayfinding signage is likely to be proposed as part of this proposal.

4 Assessment Requirements

4.1 SEARs

The Department of Planning and Environment have issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the SEARs as follows:

SEAR 7 | Ecologically Sustainable Development (ESD) and climate change	Report Reference
Identify how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated into the design, construction and ongoing operation of the proposed development.	**See Section 5.0** regarding Clause 7(4) of the Schedule 2. **See Section 6.0** for the Sustainability strategies considered in the project. **See Section 7.0** for Design for Climate Change.
Demonstrate how future buildings will meet or exceed the relevant industry recognised building sustainability and environmental performance standards.	**See Section 5.1 and 5.2** for details regarding designing and constructing to achieve recognised building sustainability and environmental performance standards. **See Section 6.0** for the Sustainability strategies considered in the project.

5 SEAR 7 | Ecologically Sustainable Development (ESD) and Climate Change

5.1 Clause 7(4) of Schedule 2

The ESD principles that are to be incorporated into the proposed development must be aligned with Clause 7(4) – Schedule 2 – Environmental Planning & Assessment Regulation (2000).

5.1.1 The Precautionary Principle

The proposed development will be constructed on a previously developed site. This will not have an adverse environmental impact and therefore alleviates concern of serious or irreversible environmental damage. Proactive measures to prevent environmental degradation have been included within the design, construction and operational phases of the proposed development. During the design and construction phases the main contractor will implement an Environmental Management System that follows NSW Environmental Management System Guidelines. Taronga has several ambitious sustainability targets that will drive efficient operation of the building, as well as and Environmental Protection Licence which ensures environmental risks are actively managed across the site.

5.1.2 Inter-Generational Equity

To uphold inter-generational equity, the proposed development minimises the consumption of energy and water resources while reducing waste.

The ESD principles incorporated into the proposed RACC facilitates the conservation of energy and water resources through energy and water efficiency measures. Energy reduction has been considered in the design of the building, through passive and active measures. The reduction in water use has been considered through high WELS equivalent water fixtures and fittings, low water demand landscaping and use of non-potable water sources where appropriate.

Waste generated during the construction and operational phases will be diverted from landfill to be recycled. An Environmental Management System (EMS) will be utilised to throughout construction. Operational waste streams will be separated to maximise recycled waste in accordance with Taronga's target of 90% diversion from landfill. environmental management practices

Reducing energy, water and waste ensures that the health, diversity and productivity of the environment is maintained for the benefit of future generations.

5.1.3 Conservation of Biological Diversity and Ecological Integrity

The existing site comprises of vegetation and an existing temporary meerkat exhibit. The project will be constructed on a previously developed site and will include removal of several trees within the building footprint and will retain all heritage listed trees (refer to the Arborists report for further details). As a result, the project will seek to reduce its impact to the surrounding biodiversity and ecological integrity.

The project's ESD principles to reduce energy, water and waste consumption have an indirect impact to conserve biodiversity and ecological integrity to the surrounding area. By minimising demand on energy and water resources, the need for land-clearing and the pollution generated from new RACC to support the surrounding area will be minimised. New landscaping and a trellis/green wall have also been considered to contribute to site's biodiversity.

5.1.4 Improved Valuation

The valuation of the project's assets and services consider environmental factors through the implementation of various ESD initiatives. An Environmental Management System will be adhered to during construction to ensure that contractors are responsible for costs associated with generating excessive pollution and waste. The project team will bear the extra cost of providing recycling and landfill waste streams during construction and operational phases. This creates a system where the polluter pays and creates and incentive to reduce pollution and waste.

The design of the project will be benchmarked against NCC, Taronga Zoo Environmentally Sustainable Design Checklist and Green Star guidelines which will provide environmental goals for the project. Project requirements stipulate design teams are contractually required to deliver targeted ESD initiatives for the project.

5.2 Framework to Reflect Best Practice Sustainable Design Principles

5.2.1 Taronga Zoo Environmentally Sustainable Design Checklist

The Taronga Zoo has developed their Environmentally Sustainable Design Checklist to maximise sustainable design initiatives specific to the zoo's requirements and includes mandatory and commended measures related to the following categories.

- Water
- Energy Efficiency
- Passive Design
- Waste Management (Construction & Demolition) & Operational
- Materials

- Indoor Air Quality
- Other Considerations

The Environmentally Sustainable Design Checklist has been applied and considered in the design of the RACC.

5.2.2 Green Star Design and As-built V1.3

The RACC has utilised the Green Star Design and As-built V1.3 rating tool as a framework to guide the project in aligning with 'Australian Best Practice' and targeting initiatives that exceed relevant sustainability performance standards, such as the National Construction Code 2019 Section J Energy Efficiency Provisions.

The Green Star Design and As-built rating system provides a framework to assess how a building reduces its impact on the environment while meeting the economic and social needs for its occupants and surrounding communities. Green Star's goal is to "lead the sustainable transformation of the built environment", by encouraging practices that:

- Reduce the impact of climate change.
- Enhance the health and quality of life of inhabitants and the sustainability of the built environment.
- Restore and protect the planet's biodiversity and ecosystems.
- Ensure the ongoing optimum operational performance of buildings.
- Contribute to market transformation and a sustainable economy.

The Green Star Design and As Built v1.3 rating system assessing buildings through the following categories:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials & Construction Waste
- Land use and Ecology
- Emissions
- Innovation

Points are awarded for a building project's ability to secure as many credits from each category. Each credit targets the environmental impact of a specific design feature. The total number of points awarded determines if the level of certification (star rating) as shown in Figure 1.

Figure 1: Available Green Star Design & As Built Certification ratings

6 Sustainable Design Principles at RACC

The following sustainable design principles have been proposed for the RACC and can be addressed through the categories outlined within the Green Star Design and As Built v1.3 rating system. The following sections are structured as follows:

- 6.1 Management Practices
- 6.2 Indoor Environmental Quality
- 6.3 Energy Conservation
- 6.4 Transport
- 6.5 Water Conservation
- 6.6 Materials & Construction Waste
- 6.7 Sustainable Sites: Land use and Ecology, and Emissions

6.1 Management Practices

The following sustainable building design and construction management practices have been considered for the RACC project. These strategies seek to implement process and practices to maximise sustainable design opportunities from project design through to construction and operation.

Sustainable Building Design and Construction Management Practices	GS DAB v1.3 Alignment
Undertake Ecological Sustainable Design workshops to identify valuable and appropriate sustainable design initiatives for the project. Inclusion of building services design workshops and reviews with the Taronga Zoo facility management teams. The Taronga Sustainability Manager will be part of workshops and involved in PCGs.	1.1 Accredited Professional 2.1 Services Maintainability Review
Establish environmental performance targets for energy and water conservation, and reporting and tracking of consumption. Inclusion of sub-metering and monitoring to facility tracking and monitoring of energy and water consumption.	2.0 Environmental Performance Targets 5.1 Environmental Building Performance 6.0 Metering and monitoring
Use durable and low maintenance materials which require very little energy to maintain over their life (such as painting, cleaning etc.)	5.2 End of Life Waste Performance
Implementation of building commissioning to ensure the building is operating efficiently as intended as per the established energy and water targets.	2.2 Building Commissioning
Building tuning practices during the first year of operation to rectify operation and efficiency issues from the building services.	2.3 Building Tuning
Inclusion of contractual requirements for the contractor to provide building information in the form of Operations and maintenance manuals, and the development of a building logbook for ongoing maintenance of the RACC.	4.1 Building Operations & Maintenance Information
Contractual requirements for the head contractor to implement an Environmental Management Plan and management system in accordance with ISO14001. The head contractor will also be provided with the Taronga construction environmental audit checklist and audited on a regular basis.	7.0 Responsible Construction Practices

Sustainable Building Design and Construction Management Practices	GS DAB v1.3 Alignment
Inclusion of adequate waste storage facilities to allow for waste separation, and collection to be further processed at the central waste storage facility.	8.0 Operational Waste

6.2 Indoor Environment Quality

The following Indoor Environment quality strategies have been considered to improve occupant comfort and wellbeing. The strategies seek to address visual comfort, thermal comfort, indoor air quality and acoustic comfort.

Indoor Environment Quality Strategies	GS DAB v1.3 Alignment
Design and installation of mechanical services in line with best practice design to reduce pollutants from sources and dust/particulates during installation. Provision of increased outdoor air to appropriate spaces and exhaust of indoor pollutants / procurement of low emitting printers and photocopiers.	9.1 Ventilation System Attributes 9.3 Exhaust OR Elimination of Pollutants
Spaces designed in accordance with best practice noise levels.	10.1 Internal Noise Levels
High Colour Rendering Index for lighting, ballasts or drivers to reduce flicker in lighting and local occupant controls.	11.1 General Illuminance & Glare Reduction 11.3 Localised Lighting Control
External shading and internal blinds to assist with glare control. Views and daylight to the harbour through windows and façade openings.	12.0 Glare Reduction 12.1 Daylight 12.2 Views
Specification of low VOC paints, adhesives, sealants and carpets (where appropriate). Specification of low formaldehyde engineered wood products.	13.1 Paints, Adhesives, Sealants & Carpets 13.2 Engineered Wood Products
Design of building fabric to assist with improved thermal comfort, through appropriate window to wall ratios, insulation level, window U-values and solar control performance.	14.1 Thermal Comfort
Implement electrolysed water (E-water) dispenser to reduce chemical footprint (especially applicable to kitchens and food prep areas).	Green Star Innovation

6.3 Energy Conservation

The RACC has adopted the energy hierarchy approach in reducing energy use. The energy hierarchy approach seeks to systematically targeting building energy use through passive means first, then supported by efficient active systems and renewable energy. The energy conservation strategies considered for the RACC are included below.

Energy Reduction Hierarchy	Energy Conservation Strategies	GS DAB v1.3 Alignment
Built Form and Massing	Passive Design - The massing of the building considers the functional requirements and has been oriented with the long axis facing north-south for better UV penetration where required for the reptiles and amphibian species. - The staff room is oriented to the south to maximise the opportunity for natural ventilation, diffused daylight with reduced solar heat gains, and views to the harbour for improved occupant comfort and energy conservation. - Openings have been considered along to facades to allow for natural and mixed mode ventilation. - Thermal grouping/zoning of spaces with similar temperature and humidity requirements.	Not specifically addressed in GS.
Demand Reduction through high performance building envelope	Passive Design - Appropriate window to wall ratios - External solar shading - Appropriate thermal performance through insulation performance and window U-values and Solar Heat Gain Coefficients (SHGC) have been considered for the thermal zones.	15A.0 Conditional Requirement 15A.1 Building Envelope 15A.2 Glazing
Efficient Systems and Electrical Demand Reduction	Active Design - High efficiency Air-conditioning (VRV) equipment such as Simultaneous heating and cooling equipment have been considered. - LED is used in all instances where custom heat lamps are not required for animal care applications. - High efficiency domestic hot water technology (Heat Pumps) has been considered. - Energy efficient lifts have been considered. - Appliances must be a minimum of 4 energy star rating.	15A.3 Lighting 15A.4 HVAC 15A.5 Domestic Hot Water 15A.9 Vertical Transport
Onsite Generation and Renewable Energy	- Solar Photovoltaics (Electricity) and Solar Thermal (Solar Hot water) have been considered for the project.	15 Greenhouse Gas Emissions reduction

Energy Reduction Hierarchy	Energy Conservation Strategies	GS DAB v1.3 Alignment
Building Networks	- Energy metering, Sub-metering of Air-conditioning, general power, lighting, domestic hot water will be considered to allow for waste energy use and peak electricity demand. Metering and monitoring do not reduce energy; however, they facilitate energy management practices. - Building Management System to track power and energy use for ongoing monitoring and reporting	6.0 Metering and Monitoring
Offsite Renewable Energy	- Offsite renewable energy has been considered.	15A.10 Off-Site Renewables
Electrification	- No fossil fuels (gas) equipment has been incorporated in the RACC.	15A.8 Fuel Switching

6.4 Transport

The RACC has limited opportunities to provide low carbon transport initiatives as it is located within the Taronga Zoo site. The Zoo can be accessed via ferry, bus and driving. The RACC has considered end-of-trip facilities such as showers and lockers for staff to encourage active transport commuting. Bicycle racks are provided at the entrance to the Zoo. No additional carparking will be included as part of this development which continues to support access by public transport.

6.5 Water Conservation

The RACC has adopted the water hierarchy approach in reducing potable water use. The water hierarchy is similar to the energy hierarchy, and seeks to reduce potable water demand, then supported by efficient distribution systems and recycled water / non-potable water sources. The water conservation strategies considered for the RACC are included below.

Water Reduction Hierarchy	Water Conservation Strategies	GS DAB v1.3 Alignment
Demand Reduction	- Low flow fixtures, fittings and appliances rated to the WELS standard. - Native landscape species selection and design. - Weather and moisture sensing technology. - Waterless heat rejection systems have been proposed.	18B.1 Sanitary Fixture Efficiency 18B.3 Heat Rejection
Efficient distribution	- Water efficient irrigation systems - Water metering of equipment.	18B.4 Landscape Irrigation

Water Reduction Hierarchy	Water Conservation Strategies	GS DAB v1.3 Alignment
Fit for purpose water sources	- Utilise water from onsite sources such as the Taronga Zoo Waste Water Treatment Plant for landscape irrigation and toilet flushing.	18B.2 Rainwater Reuse 18A Reclaimed Recycled Water (performance pathway)
Water Recycling	- Site level treated waste water i.e. rain water harvesting tank or recycled water supplied by the Taronga Zoo Waste Water Treatment Plant.	18B.2 Rainwater Reuse 18A Reclaimed Recycled Water (performance pathway)
Discharge to Sewer	- Reduced discharge from low flow fixtures.	18A Discharge to Sewer (performance pathway)

6.6 Materials & Construction Waste

The following materials and construction waste strategies have been considered for the RACC to increase the uptake of environmentally preferable materials with a focus on reuse and recycle content, reduced embodied energy, greater transparency, and reduction of waste to landfill.

Indoor Environment Quality Strategies	GS DAB v1.3 Alignment
Concrete mixes with reduction in Portland cement, contains at least 50% captured or reclaimed water, and aggregates Reduction through course or fine aggregates.	19B.1 Concrete
Reduce reinforcing steel use, sourced from a Responsible Steel Maker, and at least 60% of all reinforcing bar and mesh is produced using energy-reducing processes.	19B.2 Steel 20.1 Structural and Reinforcing Steel
Timber products used are certified by a forest certification scheme such as Forest Stewardship Council (FSC) certified. Use rapidly renewable materials (eg. bamboo flooring) where possible.	20.2 Timber Products
All permanent formwork, cables, pipes, flooring and blinds do not contain PVC and have an Environmental Product Declaration (EPD) OR meet Best Practice Guidelines for PVC.	20.3 Permanent Formwork, Pipes, Flooring, Blinds & Cables
Preference for products and materials with sustainability credentials such as Reused Products, Recycled Content Products, Environmental Product, Declarations, Third Party Certifications (such as GECA) and Stewardship Programs. Where possible, materials and appliances from old Serpentaria demolition will be reused in this development.	21.1 Product Transparency
Commit to at least 90% of the waste generated during construction and demolition to be diverted from landfill for recycling. This includes re-use of	22.1 Demolition and Construction Waste

Indoor Environment Quality Strategies	GS DAB v1.3 Alignment
onsite spoil where appropriate, or back fill aggregate with clean recycled content (e.g. Construction Demolition waste aggregate).	
Minimise on site cutting noise and waste, standard size materials or prefabricated materials used, or materials cut to size at supplier's premises.	Not addressed in Green Star
Materials are sourced locally where possible to reduce emissions associated with transportation.	19A life Cycle Impacts

6.7 Sustainable Sites: Land use and Ecology, and Emissions

The following sustainable site strategies have been considered to:

- Reduce the negative impacts on sites as a result of construction and development and enhancing the local ecology.
- Reduce the negative impacts associated with buildings, such as refrigerant leaks, storm water peak discharge and pollution and light pollution disturbing native animals which is extremely important in context of Taronga Zoo.

Sustainable Site Strategies	GS DAB v1.3 Alignment
Water Sensitive Urban Design principles are incorporated Porous/permeable landscaping and ground surfaces where appropriate to reduce stormwater runoff.	26.1 Peak Discharge 26.2 Stormwater Pollution Targets 18B.4 Landscape Irrigation 25.1 Heat Island effect
Plant vegetation (animal feed) in landscaping Native planting cuttings used to feed animals).	23. Ecological Value Partially addressed in Green Star, provides further enhancement through productive landscape.
No critically endangered, endangered, vulnerable species or ecological communities were present on the site at the time of purchase. The site does not include old growth forest or wetland of 'High National Importance', or did not impact on 'Matters of National Significance'	23.0 Endangered, Threatened or Vulnerable Species 24.0 Conditional Requirement
Site contamination is identified with remedial steps undertaken to decontaminate site prior to construction	24.2 Contamination and Hazardous Materials
Consideration of site surface treatments to reduce heat island effect, such as vegetation and light-coloured roofs to reflect solar radiation.	25.1 Heat Island effect
Achieve a reduction in peak sewer discharge comparing pre-development to post-development discharge. Achieve a reduction in pollution levels	26.1 Peak Discharge 26.2 Stormwater Pollution Targets

Sustainable Site Strategies	GS DAB v1.3 Alignment
All outdoor lighting to comply with AS4282:1997 to reduce light pollution, downlighting for external light fixtures including external pathway.	27.0 Light Pollution Neighbouring Properties 27.1 Light Pollution Night Sky
Microbial control from air-conditioning heat rejection systems is eliminated through the use of VRV units and air-cooled heat rejection.	28.1 Microbial control
R32 refrigerant has been considered for all refrigerant based systems. R32 refrigerant has zero ozone depletion potential (ODP).	29.1 Refrigerants
Minimise on site cutting noise and waste, standard size materials or prefabricated materials used, or materials cut to size at supplier's premises.	Not addressed in Green Star

7 Design for Resilience to Climate Change

The project requires design features that will future-proof itself from the impacts of climate change. NSW and ACT Government Regional Climate Modelling (NARCLiM) has identified the following climate change projections:

1. More hot days and fewer cold nights
2. Increase the number of heatwave events
3. More hot days above 35°C; particularly in Spring and Summer
4. Rainfall will increase in Summer and Autumn and decrease in Winter and Spring
5. Change in rainfall patterns will affect drought and flooding events

These projections will have an impact on operational costs and occupancy comfort and safety. Hotter days with more heatwaves will particularly affect staff, visitors and reptiles and amphibians and the operation of building services equipment. This will also require higher capacity and operational costs for mechanical services to maintain occupancy comfort. Increased drought events will require provisions to supplement shortages in potable water. Stronger and reinforced façade components will be required to withstand increased rainfall and wind gust events.

The design initiatives in the following table aim to mitigate the effect of future climate change while maximising efficiency in energy, water and material use. These measures should allow the project to meet the difficulties predicted by the CSIRO's climate change projections while maintaining occupancy comfort and operational efficiency.

Climate Change Projections	Climate Change Design Initiatives
Hotter days and more frequent heatwave events	- Minimise unwanted solar heat gain into spaces through shading and glazing performance. - Improve efficiency of mechanical services. - Utilise translucent skylights to allow light, however, reduce solar heat gains.
Extreme Heat	- Utilise landscaping and trees to reduce surface temperatures for a cooler microclimate during warmer seasons. - Improved thermal performance building fabric will be utilised to mitigate heat discomfort and heat stress. - Mechanical system will be designed to provide adequate thermal comfort to occupants and reptile and amphibian ensure safe operation of equipment during extreme heat events.
Extended drought periods	- Collected rainwater and/or recycled water supplied by Taronga's Wastewater Treatment Plant to support landscaping. - Landscaping with native low-water plant species.
More extreme rainfall events	- Increase peak stormwater discharge capability. - Increase over-flow drainage from site. - Civil infrastructure design to prevent soil erosion.
Storms and Flooding	- Increase permeability where possible to prevent stormwater run-off. - Increase peak stormwater discharge capability. - Increase over-flow drainage from site. - Centralised Recycled Water Treatment facility to capture stormwater for reuse.
Gustier wind conditions	- Consideration of reinforced façade and drainage of the building, respite, and shelter areas.