



EMERGEN

SUSTAINABILITY STRATEGY REPORT

PROPOSED CHILDCARE CENTRE

21 BIRKSHIRE ROAD, FORRESTFIELD

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1 OVERVIEW

EMERGEN has developed a sustainable design report on the proposed new Childcare Development, at 21 Berkshire Road, Forrestfield in consultation with West Property Group.

The purpose of this report is to support the design team in achieving sustainable outcomes for the development by identifying the principles incorporated in the design that meet sustainable objectives and targets for the site.

2 TARGETS

The design team will utilise a structured approach to achieve a sustainable outcome for the design and construction of the development including the following Sustainability Targets.

Table 1: Environmentally Sustainable Design Strategy

ITEM	ENVIRONMENTALLY SUSTAINABLE DESIGN INITIATIVES	TARGET
Energy Use Reduction	Target 30% energy reduction over NCC minimum via passive design, efficient envelope, and shading.	☐
Renewable Energy	Rooftop solar PV system to offset operational energy and lower emissions.	☐
Efficient Mechanical Systems	Energy-efficient HVAC system with potential for mixed-mode ventilation and seasonal setpoints.	☐
Water Fixtures & Fittings	All fixtures to meet minimum WELS ratings (e.g., Taps 5-star, Toilets 4-star, Showers 3-star).	☐
Water Reuse / Capture	Feasibility of rainwater harvesting for irrigation to be investigated.	☐
Efficient Hot Water	Heat pump hot water system preferred for low energy demand and long lifespan.	☐
Artificial Lighting	LED lighting designed to be 20% below NCC load limits, with sensors and controls.	☐
Construction Waste	≥80% of construction waste to be diverted from landfill through effective sorting and recovery.	☐
Operational Waste	Waste plan to include space for 3 waste streams: general, recycling, and organics. Clear signage and bins provided.	☐
Sustainable Materials	Prioritise low-carbon, recycled-content, or EPD-certified materials. Investigate low-carbon asphalt for carparks.	☐
Low VOC Finishes	Use low-VOC paints, adhesives, and sealants to support indoor air quality.	☐
Heat Resilience	Increase green cover, use light-coloured materials, and apply passive design to reduce urban heat impact.	☐





Urban Cooling & Health	Design aligned with WA Health guidance for heat resilience in early learning settings.	☐
Water-Efficient Landscaping	Use native/drought-tolerant plants, drip irrigation, and retain existing trees where possible.	☐
Tree retention	Retain mature existing trees where feasible to provide passive shading, reduce heat island effect, and support biodiversity	☐
Community Garden	Where feasible, provide a small garden to support sustainability education, cooling, and community engagement.	☐
Biodiversity Enhancement	Plant locally endemic species to enhance site ecology and reduce irrigation/fertiliser needs.	☐
Sustainable Transport	Provide bicycle parking, EOT facilities, and EV charging provisions to support low-emissions transport.	☐





3 PROJECT INFORMATION

The proposed development is located at Lot 500 (21 Berkshire Road), Forrestfield WA, on a partially cleared site with existing vegetation retained where feasible. The project involves the construction of a contemporary single-storey childcare facility designed to accommodate 104 children and 20 staff. The development aims to enhance local early learning infrastructure by delivering improved accessibility, a functional and safe car park layout, and upgraded landscaping that includes shade, native vegetation, and outdoor play integration.

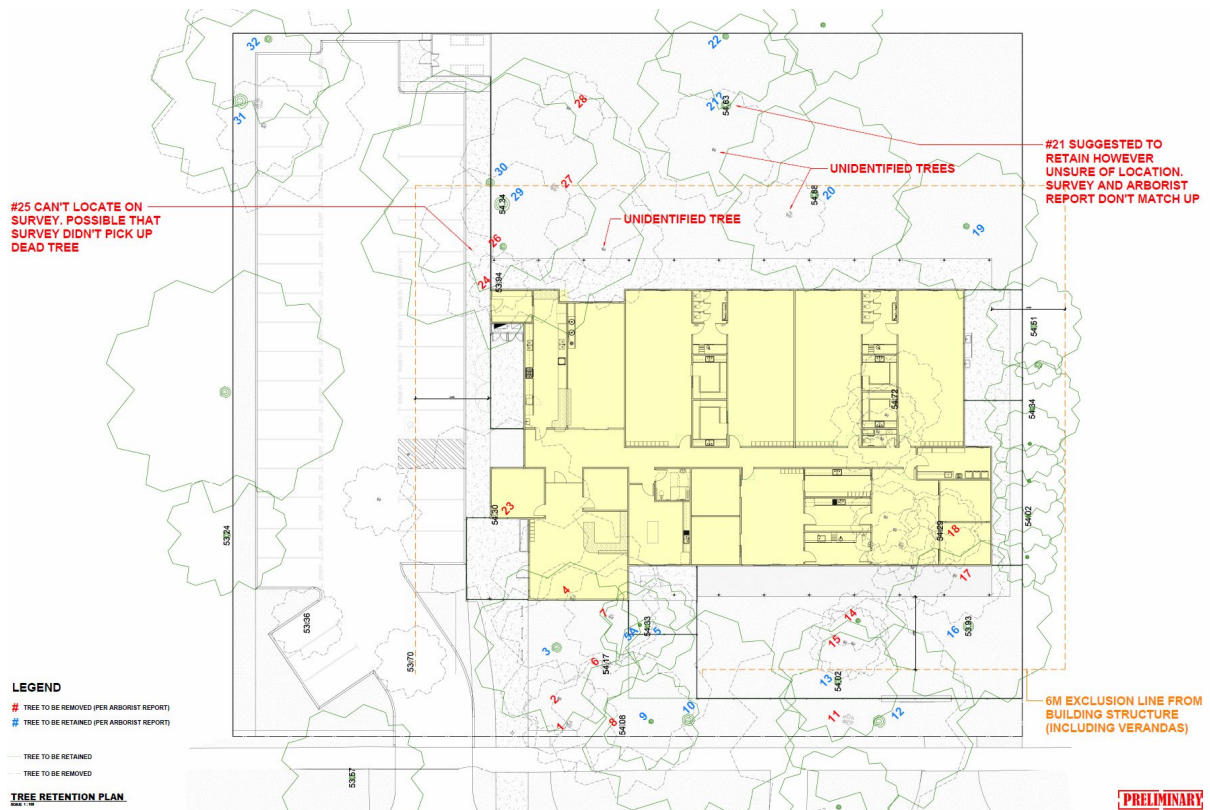


Figure 1: Existing Site Image/proposed development concept



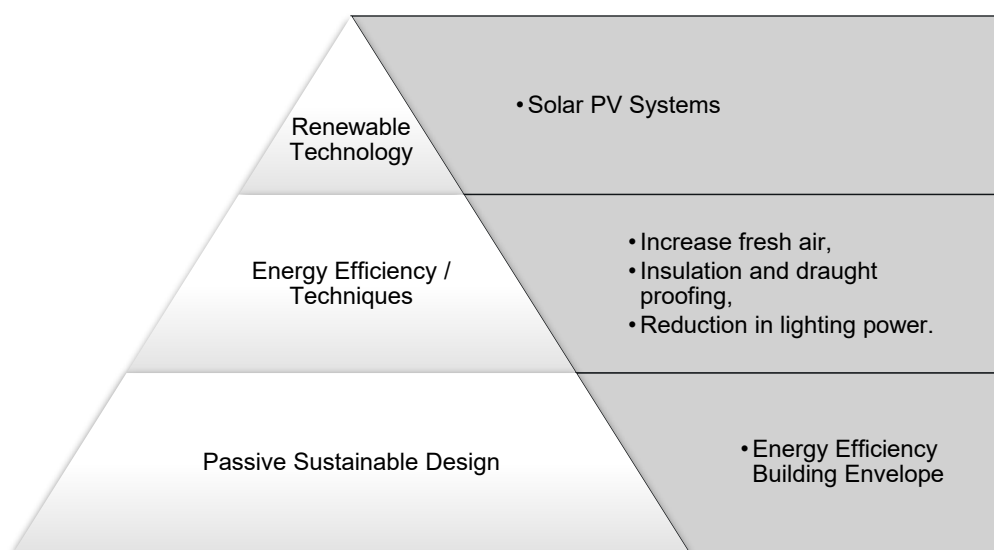


4 OVERVIEW OF SUSTAINABILITY INITIATIVES

4.1 ENERGY USE REDUCTION

Energy savings in a building can be realised by minimising the need for heating and cooling through a well-designed and insulated façade. The design team will focus on enhancing energy efficiency by exceeding the minimum requirements of NCC Section J. This will involve optimising the building envelope, air conditioning and ventilation systems, and lighting to ensure lower energy consumption. Façade U-Value and SHGC targets to be confirmed via energy modelling during detailed design phase.

Figure 2: Energy Reduction Strategy



The Childcare Centre building has been designed with solar passive principles in mind. The building is well orientated on site, maximising northern exposure to provide passive heating in the winter months to staff areas. Extensive shading has been incorporated into the design for the East and West facades, providing protection to the glazing from direct solar radiation in the summer months, with the objective to maximise views and building occupants connection to nature, while providing protection from morning/afternoon sun and glare. Daylight autonomy modelling is recommended to refine glazing strategy in detailed design.

4.2 RENEWABLE ENERGY

The installation of a rooftop solar photovoltaic (PV) system is proposed as part of the building's sustainability strategy. On-site solar PV systems offer a wide range of benefits. Firstly, they significantly reduce operational energy costs by generating clean, renewable electricity directly from sunlight, lowering dependence on grid-supplied power. This reduction in grid energy use not only cuts costs but also helps minimise greenhouse gas emissions, supporting broader environmental and climate goals.

The Childcare centre concept design shows a 982m² roof, a solar PV system is ideal to reduce operational energy use for this building. As majority of the building's operation will be during daylight hours. Once proposed building energy loads have been calculated an appropriately sized system should be selected to





support the buildings transition to a low carbon future while delivering long-term financial and environmental benefits to the project.

Emergen have calculated potential estimated area requirements based on 3 standard sized PV systems.

Table 2: Estimated Area required based on Solar PV System Size

SOLAR PV SYSTEM	10kW SYSTEM	25kW SYSTEM	50kW SYSTEM
Area required (m ²)	46.4m ²	115m ²	230m ²

4.3 MECHANICAL SYSTEMS

Considerations should be made for an energy efficient central mechanical plant for the Childcare Centre. It is recommended that the following energy saving initiatives are investigated by the Mechanical consultant:

- Mixed mode system – allowing for operable windows and increased natural ventilation/ fresh air for building occupants.
- Utilising Seasonal setpoints for Mechanical Systems to improve thermal comfort for building occupants and reduce energy consumption.

4.4 WATER EFFICIENT SANITARY FIXTURES AND FITTINGS

Western Australia has a limited potable water supply due to the increases in population and reductions in annual rainfall levels. By reducing demand this will help to alleviate the concerns related to potable water usage. The development should aim to achieve a minimum 20% reduction in potable water consumption compared to established benchmarks.

FIXTURE / EQUIPMENT TYPE	WELS RATING	MINIMUM WATER EFFICIENCY
TAPS	5 Star	5L/min
URINALS	5 Star	1L/min
TOILETS	4 Star	3.5L/flush
SHOWERS	3 Star	7L/min
DISHWASHER	5 Star	7.5L/Cycle

4.5 WATER RE-USE

An analysis should be undertaken to determine the feasibility for a potential water reuse system for the Childcare Centre. When looking at a water re-use system it is important to consider various factors, including water demand, site conditions, water availability, and the intended use of the collected water.





A rainwater Harvesting system collects rainwater from roof surfaces, and stores the water in a rainwater tank, which can then be used for non-potable uses such as landscape irrigation throughout the Site, or for non-potable water requirements such as flushing toilets.

PROS	CONS
<ul style="list-style-type: none">• Simple system with minimal treatment required (e.g., filtration).	<ul style="list-style-type: none">• Limited availability during the dry season.
<ul style="list-style-type: none">• Lower upfront costs involved.	<ul style="list-style-type: none">• May require large storage tanks to meet demand during low rainfall periods.

The average annual rainfall in Forrestfield, WA is approximately 612mm with most rain occurring between May and August. Rainwater harvesting potential based on the roof area of the Childcare Centre and annual rainfall at the site is approximately 800L/ year. Water use calculations will need to be conducted to ensure an appropriate size tank is selected, and that the system would be able to meet the water demands for landscape irrigation.

4.6 EFFICIENT HOT WATER SYSTEM

The building will incorporate an efficient Hot Water System. Heat Pump hot water heaters offer several significant benefits in comparison to conventional Electric or Gas Hot water heaters. A Heat Pump system will generally have a higher upfront cost, but longer lifespan, and they are less energy intensive over the lifecycle of the building than an Electric or Gas Unit. Reducing the buildings energy demand and green house gas emissions. Peak water demand will need to be factored in so that the system can cover the demand.

4.7 ARTIFICIAL LIGHTING

Lighting within the building must meet the following criteria:

- All lighting must be flicker-free.
- Light sources must have a minimum Colour Rendering Index (CRI) average R1 to R8 of 85 or higher and have a CRI R9 of 50 or higher.
- Light sources must meet best practice illuminance levels for each task within each space type with a maintained illuminance that meets the levels recommended in AS/NZS 1680.1:2006 series applicable to the project type and including maintenance.
- The maintained Illuminance values must achieve a uniformity of no less than that specified in Table 3.2 of AS/NZS 1680.1:2006, with a maintenance factor method as defined in AS/NZS 1680.4.; and
- All light sources must have a minimum of 3 MacAdam Ellipses.
- The walls within the field of view of occupants in regularly occupied spaces must have an average surface reflectance value of 0.70 and an average surface illuminance of at least 50% of the horizontal illuminance levels required for task.
- Vertical illuminance in workspaces: ensure that 50% of the horizontal task illuminance reaches the average eye height for 90% of primary spaces using vertical illuminance calculation grid.
- The illuminance values must be calculated in accordance with AS/NZS 1680 series for the relevant task.





External Lighting must meet the following criteria:

- External lighting to meet AS 4282 and Wildlife Sensitivity requirements, regarding light quality, light pollution and light spill.

4.7.1 EFFICIENT LIGHTING AND CONTROL

The installed aggregate illumination power has been designed to be **20%** below the maximum illumination power based on maximum allowable lighting power densities defined in Table J7D3b of the NCC 2022. Motion Detectors and daylight sensors are recommended to reduce energy demand.

Table 3: Lighting Characteristics

PARAMETER	PROPOSED BUILDING	REFERENCE BUILDING
LIGHTING TYPE	LED light fittings	LED light fittings
DESIGN ILLUMINANCE (LUX)	Various lux	Various lux
NOMINAL LIGHTING POWER DENSITY (W/M ²)	20% less compared to NCC max requirements.	As per NCC max requirements.
OCCUPANT SENSOR CONTROLS	Motion sensors	N/A
DAYLIGHT CONTROLS	Yes	N/A
OTHER LIGHTING CONTROLS	Timer switches	N/A
ADJUSTMENT FACTOR APPLIED	0.9 – Motion sensor 1 0.7 – Motion sensor 2 0.55 – Motion sensor 3	Room Aspect Ratio

4.8 CONSTRUCTION & DEMOLITION WASTE

At least **80%** of construction waste generated on-site will be diverted from landfill by the Builder through effective waste management practices. Construction waste will predominantly be separated into two main streams: one for steel and aluminium, and another for general waste. This streamlined approach facilitates efficient sorting and maximises recovery rates for recyclable materials.

4.9 OPERATIONAL WASTE EFFICIENCY

A waste planning expert will produce an Operational Waste Management Plan (OWMP) that addresses best practice in operational waste management, including:

- Identifying the objectives of the plan, by setting diversion from landfill targets and / or target for reducing total materials generation (general waste materials + recyclable / reusable materials);
- Clearly identify waste streams including general waste, paper and cardboard, glass and plastic;
- Clearly identify applicable bins for various waste streams, that allow for separation of recyclable streams – or use of comingled systems where appropriate.
- Clearly identify at least one other waste stream that can be recycled, and for which recycling facilities are provided.
- Clearly identify storage areas for all waste streams identified in the OWMP.





- Area to be sized sufficiently for all streams nominated above, based on waste generated by the project and the collection frequency for each stream; and
- Calculations shall be based on third-party best practice guidelines.
- Outline best practice access requirements for the collection of all waste streams identified in the OWMP.
- Outline individual roles responsible for delivering and reviewing the OWMP

4.10 SUSTAINABLE MATERIALS

A well-thought-out materials strategy contributes significantly to the sustainability and resilience of the built environment. Implementing efficient use of materials involves selecting, sourcing, and using materials in ways that minimise environmental impacts, reduce waste, and improve the life cycle performance of the built environment. The following considerations should be made when selecting materials for the development:

- **Low Embodied Energy:** Choose materials that require minimal energy to produce, process, and transport. Examples include locally sourced stone, timber, and recycled materials.
- **Sustainably Sourced:** Prioritise materials certified by sustainability standards, such as FSC-certified timber or low-carbon concrete.
- **Recycled and Reused Content:** Use materials with high recycled content or those that can be reclaimed and reused (e.g., recycled steel, reclaimed timber, or concrete with recycled aggregate).
- **Durability and Longevity:** Select materials that have a long lifespan and are resistant to wear and damage. Longer-lasting materials reduce the need for replacements and the associated environmental impact.
- **Local Sourcing:** Prioritise local materials to reduce transportation emissions and support local economies.
- **Design for Deconstruction and Disassembly:** Design buildings and structures in a way that allows for easy disassembly and reuse of materials at the end of their life

4.11 LOW VOC FINISHES

Internal Finishes (paints, adhesives, sealants, carpets) with low VOC and formaldehyde content will be prioritised.

All internally applied paint products will meet the Total Volatile Organic Compounds (TVOC) contents as per table below.

Table 4: TVOC Limits

PRODUCT TYPE/SUB-CATEGORY	MAX TVOC CONTENT (G/L)
Walls and ceilings – interior gloss	75
Walls and ceilings – interior semi-gloss	16
Walls and ceilings – interior low sheen	16
Walls and ceilings – interior flat washable	16





PRODUCT TYPE/SUB-CATEGORY	MAX TVOC CONTENT (G/L)
Ceilings – interior flat	14
Trim – gloss, semi-gloss, satin, varnishes and wood stains	75
Timber and binding primers	30
Latex primer for galvanized iron and zincalume	60
Inter latex undercoat	65
Interior Sealer	65
One and Two pack Performance Coatings for floors	140
Any solvent-based coatings whose purpose is not covered in table	200

Using low VOC (volatile organic compounds) products offers numerous benefits, primarily by enhancing indoor air quality and promoting better health. These products release fewer harmful chemicals, reducing the risk of respiratory issues, headaches, dizziness, and long-term health problems. Environmentally, low VOC products contribute less to air pollution and smog formation, supporting a healthier ecosystem.

4.12 HEAT RESILIENCE

The heat island effect occurs when urban areas are warmer than their rural surroundings due to the built environment. The design has incorporated light-coloured roof materials, light coloured hardscaping and shaded landscaped areas, which significantly mitigates this effect and enhances energy savings.

The development will dedicate more than **75%** of the entire site area to include one or a combination of the following:

- Vegetation.
- Roofing materials, including shading structures, to have light colour (Initial SRI of 82).
- Unshaded hard-scaping elements to have a light colour.
- Hardscaping elements shaded by overhanging vegetation or roof structures, including photovoltaic panels.

4.13 URBAN COOLING & COMMUNITY HEALTH

In response to Perth's increasing exposure to extreme heat events, the design prioritises, where appropriate, strategies that reduce localised heat stress - particularly for vulnerable populations such as young children. Design responses are aligned with WA Department of Health guidance on mitigating heat-related stress in early learning environments. Measures include high-albedo roofing and paving, retention of existing mature trees to provide natural shade, increased canopy coverage, shaded outdoor areas, and the integration of passive cooling design principles to reduce indoor temperatures without excessive





reliance on mechanical systems. These strategies support both environmental resilience and community health outcomes.

4.14 COMMUNITY GARDEN & OUTDOOR LEARNING OPPORTUNITIES

Where feasible, the development will incorporate a small-scale kitchen or community garden to support sustainability education, wellbeing, and community connection. These gardens can offer hands-on learning opportunities for children, helping foster early awareness of food systems, seasonal planting, and environmental stewardship.

The inclusion of raised garden beds or edible native plants will also support biodiversity, urban greening, and passive cooling benefits. The design team will investigate space, sun access, and irrigation feasibility during detailed design to ensure successful implementation.

4.15 WATER EFFICIENT LANDSCAPING

Water-efficient landscaping refers to techniques and strategies aimed at conserving water while maintaining aesthetically pleasing and functional outdoor spaces. This is important in Western Australia due to its semi-arid climate conditions, which often result in water scarcity. Key strategies include:

- All garden beds will be equipped with an efficient irrigation system to ensure optimal water distribution and plant health. A **sub-mulch drip irrigation system** will be installed for all garden beds, delivering water directly to the root zone beneath the mulch layer.
- **Turf areas** will be irrigated using **recessed sprinklers**, which provide even coverage and retract below the surface when not in use, maintaining safety and aesthetics.
- The entire irrigation system will be managed by an **automatic controller**. A **rain sensor** will be integrated into the system to prevent overwatering by pausing irrigation during and after rainfall.

4.16 EXISTING TREE RETENTION

Mature trees will be retained where feasible to support urban cooling, provide passive shade to outdoor areas, and preserve site biodiversity. The Tree Retention Plan indicates key trees to be preserved with a 6m exclusion zone applied during construction.

4.17 BIODIVERSITY ENHANCEMENT

Urban ecology is crucial for conserving biodiversity and enhancing urban life. Well-planned buildings and landscapes protect biodiversity and support sustainable practices, including low water and fertiliser use and the selection of native plants.

Where feasible the primary focus for newly landscaped areas is to provide a diversity of species of native and locally endemic vegetation to enhance biodiversity on the site.





4.18 SUSTAINABLE TRANSPORT OPTIONS

It is the intention of this category to reduce building occupant's dependency on carbon intensive vehicles. The development should incorporate Bicycle racks for building occupants and visitors, with End of Trip facilities allocated for staff. Infrastructure to allow for future installation of minimum x2 metered EV charging stations will also be incorporated.

5 CONCLUSION

In conclusion, this is a concept stage for sustainability initiatives. The presented strategies should be investigated further by the design team as the design progresses.

The presented report provides a comprehensive overview of sustainability commitments that harmonise seamlessly with the core principles of State Planning Policy 7.0: Principle 5 Sustainability. Based on the sustainability initiatives proposed the development has the ability to achieve a best practice sustainability outcome, delivering positive environmental, social and economic outcomes.

