April 2025

Taronga Zoo Sky Safari

Appendix Q
Environmental Sustainability Design Report (ESD) and Net Zero Report
RTS Revision 2

PREPARED BY

CUNDALL

PREPARED FOR

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27 February 2025

Dear Sir / Madam

Consultant Declaration Letter

SEARs Project Number: SSD-46807958

Project Name: Sky Safari at Taronga Zoom

Date: 17/04/2025

This statement is to confirm that Cundall was engaged to prepare an updated ESD Report and Net Zero Carbon Statement due to changes in project description and design, as listed below:

- Updated project description
- Changes to external spaces and associated lighting energy
- Layout changes for staff rooms and amenities at both station levels

The updated sections from within each document are as follows:

- Design for Environmental Performance Report: Sections 1.1 and 1.3
- Net Zero Carbon Statement: Sections 4.4 and 4.5

Yours sincerely
For and on behalf of
Cundall Johnston and Partners Pty Ltd

Hannah Morton
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Taronga Zoo Sky Safari

Design for Environmental Performance Report

Taronga Conservation Society Australia

Job Number:	1037653
Document Ref:	1037653-RPT-SY-001
Revision:	C
Revision Date:	17 April 2025

Acknowledgement of Country

In the spirit of reconciliation, Cundall acknowledges the Traditional Owners and Custodians of the Country of all locations where we live and work.

We acknowledge and respect their stories, traditions, and living cultures, including the complex interconnections between human, spiritual and natural systems, custodianship of land, and managing resources to continue to meet the needs of future generations.

We pay our respects to the Elders past, present and future, and recognise their unique connection to lands, waters, sky, and winds. We would also like to extend that respect to all First Nations People.

Project title	Taronga Zoo Sky Safari	Job Number
Report title	Design for Environmental Performance Report	1037653

Document History

Revision Ref	Issue Date	Purpose of issue / description of revision
—	06 November 2023	DRAFT for Coordination
A	24 July 2024	SSDA Issue
B	19 February 2025	SSDA Issue – RtS Update
C	17 April 2025	SSDA Issue – RtS Update

Document validation (latest issue)

X 

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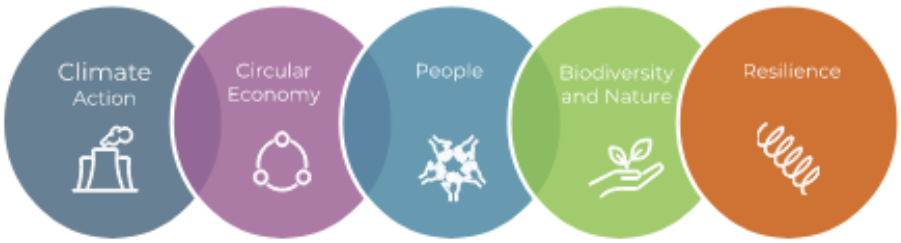
Executive Summary

This Sustainability Report has been prepared by Cundall to accompany a detailed State Significant Development Application (SSDA) for the redevelopment of the Sky Safari at Taronga Zoo. The site is legally described as Lot 22 on Deposited Plan 843294 and is Crown Land managed by the Taronga Conservation Society Australia (TSCA).

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-46807958) and provides an assessment of development-appropriate measures that the project will implement in design and operation to minimise its negative environmental impact.

A project-specific Sustainability Strategy has been developed for the project which aligns with and builds on TSCA's broader Sustainability Strategy and the relevant United Nations Sustainable Development Goals (UNSDGs).

The sustainability strategy provides an overarching framework for all sustainability aspects of the development with a focus on the following key themes.



This report concludes that the proposed sky safari development is suitable and warrants approval subject to the implementation of the following mitigation measures:

- Minimise operational energy use in the buildings through efficient air-conditioning and lighting.
- Minimise operational energy use in cable car operation.
- 100% renewable electricity will be procured and used throughout the site.
- Reduce upfront carbon used in the buildings and civil works.
- Responsible management of stormwater pollution and runoff.
- Procurement of more responsible materials, including certified products and those with a higher recycled content.
- Waste minimization plan implemented to reduce waste to landfill during demolition, construction, and operation.

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

The initiatives will be tracked over the lifetime of the project with measurable outcomes defined to provide positive outcomes for the environment and people.

Contents

1.0 Introduction & Project Description

1.1 Introduction

This report has been prepared to accompany an SSDA for the redevelopment of the Sky Safari at Taronga Zoo, which is legally described as Lot 22 on Deposited Plan 843294.

Taronga Conservation Society Australia (TCSA) is a a statutory body representing the Crown. The Minister for Planning and Public Spaces, or their delegate, is the consent authority for the SSDA and this application is lodged with the NSW Department of Planning, Housing and Infrastructure (**DPHI**) for assessment as the works are located within the Taronga Zoo site and have an estimated development cost that exceeds the $10 million threshold pursuant to Clause 2(h) of Schedule 2 of the *State Environmental Planning Policy (Planning Systems) 2021*.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 11 August 2022 and issued for the SSD- 46807958. Specifically, this report has been prepared to respond to the SEARs requirements issued below.

Table 1.1: SEARs Requirements

Key Issue	Description	Response Reference in Report
Ecologically Sustainable Development	▪ Identify how ESD principles (as defined in Clause 193 of the Environmental Planning and Assessment Regulations 2021) are incorporated in the design and ongoing operation of the development.	Section 3.0 – Ecologically Sustainable Development (ESD)
Ecologically Sustainable Development	▪ Demonstrate how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards.	Section 3.0 – Ecologically Sustainable Development (ESD)
Ecologically Sustainable Development	▪ Demonstrate how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.	Section 3.0 – Ecologically Sustainable Development (ESD) Net Zero Carbon Statement '*1037653-CAN-SY-002 - Net Zero Statement - Rev B*'

The SSDA was placed on public exhibition for 28 days between 24 September to 22 October 2024. Since lodgement, the project team have refined the proposal to address comments from public agencies and the public as well as ongoing design development. The proposed refinements include updates to the Top and Lower Stations to improve queuing and visitor experience and the pylon design to reflect inputs from the cable car contractor.

1.2 Site Description

Taronga Zoo is located at Bradleys Head Road, Mosman and is situated in the Mosman Local Government area (LGA) and on Cammeraigal Country. 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). Taronga Zoo has been subject to numerous upgrades and redevelopment schemes over time, to stay compliant with contemporary regulations, meet contemporary animal welfare and contemporary visitor experience expectations.

Taronga Zoo has evolved over time from a Zoo that simply provides the traditional visitor experience of viewing animals in exhibits, to a Zoo that focusses on wildlife conservation, animal welfare and providing a range of visitor learning experiences. Taronga Zoo is one of Australia's most popular attractions, and together with Taronga Western Plains Zoo hosts more than 1.8 million visitors annually.

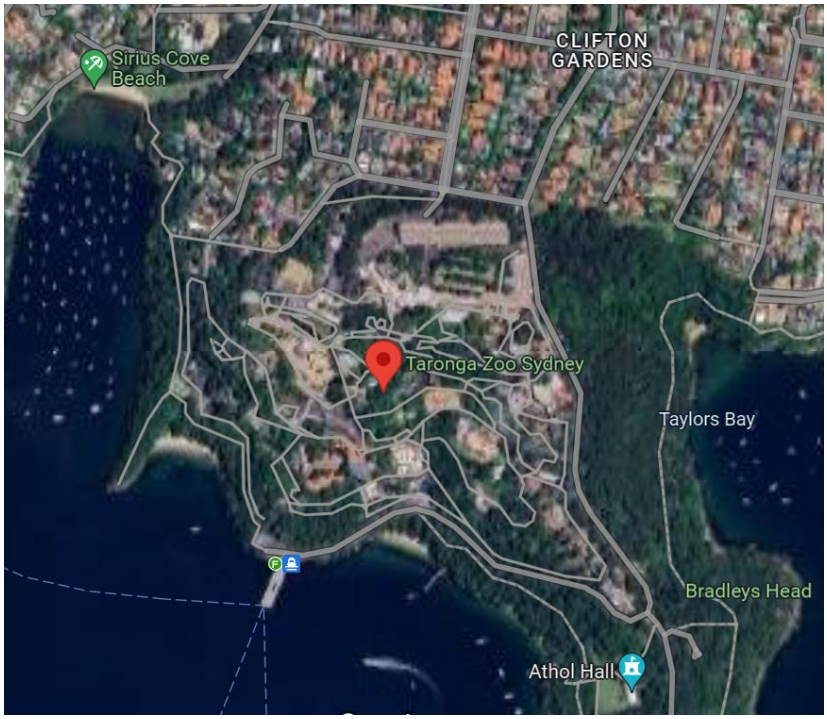


Figure 1: Site location

1.3 Project Description

Taronga Zoo is one of Australia's most popular attractions, and together with Taronga Western Plains Zoo hosts more than 1.8 million visitors annually. The Zoo has evolved over time from a Zoo that simply provides the traditional visitor experience of viewing animals in exhibits, to a Zoo that focusses on wildlife conservation, animal welfare and providing a range of visitor learning experiences.

Within Taronga Zoo, the Sky Safari is one of Taronga's most loved experiences and has transported more than 20 million passengers since it was first installed in 1987 and upgraded in 2000. The former Sky Safari was an ageing asset and was formally retired in January 2023. The redevelopment of the existing Sky Safari will allow the Zoo to update the now obsolete infrastructure on site and provide new facilities which provide improved amenities, ease increased demand, and assist the public in moving around the Zoo.

Development consent is specifically sought for:

- Site establishment works including removal of the existing Sky Safari
- Installation of a new 916m Sky Safari cable car system including:
  - Construction of six (6) new pylons and associated infrastructure within pylon zones within the Zoo ranging in height between 5.9m (P1) to 36.5m (P5)
  - Construction of two new stations at both the upper and lower entrances within the Zoo grounds.
  - Public facilities including accessible queueing areas, ticket booths and public amenities.
  - Associated mechanical plant, servicing and storage areas for ongoing maintenance.
- Landscaping works, including new accessible pathways, planting, shade structures and seating areas, and wayfinding signage. Taronga has implemented a tree replacement ratio of 2:1 for all trees removed as part of this development.
- Excavation, site preparation works and tree removal/pruning to allow the works to occur.
- Increased hours of operation.

2.0 Regulatory Compliance

This section outlines how the project will respond the relevant regulatory requirements.

2.1 Secretary's Environmental Assessment Requirements (SEARs)

The following table outlines how the project will respond to the Secretary's Environmental Assessment Requirements (SEARs), dated 11/08/2023.

Table 2.1: SEARs Requirements

Key Issue	Description	Response Reference in Report
Ecologically Sustainable Development	▪ Identify how ESD principles (as defined in Clause 193 of the Environmental Planning and Assessment Regulations 2021) are incorporated in the design and ongoing operation of the development.	Section 3.0 – Ecologically Sustainable Development (ESD)
Ecologically Sustainable Development	▪ Demonstrate how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards.	Section 3.0 – Ecologically Sustainable Development (ESD)
Ecologically Sustainable Development	▪ Demonstrate how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.	Section 3.0 – Ecologically Sustainable Development (ESD) Net Zero Carbon Statement '*1037653-CAN-SY-002 - Net Zero Statement - Rev B*'

2.2 Ecologically Sustainable Development

Table 2.2 below details how Ecologically Sustainable Development (ESD) principles (as defined in Clause 193 of the Environmental Planning and Assessment Regulations 2021), have been addressed by the project:

Table 2.2: Incorporation of ESD principles in line with Clause 193 of the Environmental Planning and Assessment Regulations 2021

EP&A Regulation 2000 Clause	Response
4(a) Precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: ▪ Careful evaluation to avoid, wherever practicable, serious, or irreversible damage to the environment, and ▪ An assessment of the risk-weighted consequences of various options.	The project will incorporate a range of ESD initiatives to minimise its ecological footprint and reduce resource use including energy, water, and material resources (Refer Section 3). Impacts to existing biodiversity on-site have been assessed in the Streamlined Biodiversity Development Assessment Report, and strategies to minimise / offset those impacts are outlined in that report. An Environmental Management Plan will be implemented in construction to manage environmental impacts during construction. The project will apply industry best practice ESD initiatives and work to protect the nature and ecology of the site.

EP&A Regulation 2000 Clause	Response
4(b) **Inter-generational equity**, namely, that the present generation should ensure that the health, diversity, and productivity of the environment are maintained or enhanced for the benefit of future generations.	As above
4(c) **Conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.	Incorporation of onsite landscaping with indigenous, low water use, drought resistant plant species. Impacts to existing biodiversity on-site have been assessed in the Streamlined Biodiversity Development Assessment Report, and strategies to minimise / offset those impacts are outlined in that report. Water Sensitive Urban Design principles are being adopted in the landscape / civil design to minimise stormwater runoff and control runoff pollution loads.
4(d) **Improved valuation, pricing, and incentive mechanisms,** namely, that environmental factors should be included in the valuation of assets and services.	Sustainability initiatives have been evaluated in terms of value and cost-effectiveness.

2.3 State Environmental Planning Policy (Sustainable Buildings) 2022

The State Environmental Planning Policy (SEPP) 2022, also known as the Sustainable Buildings SEPP, sets targets and initiatives in for different development types in order to ensure the reduction of their GHG emissions, through measurement and verification of their sustainable performance.

The following criteria have been addressed by the project:

2.3.1 C.2 General Sustainability Requirements

Table 2.3: Response to Sustainable Buildings SEPP 2022

Criteria	Response
Minimise waste from associated demolition and construction, including choice and reuse of building materials	A Construction Waste Management Plan will be prepared including a target of 80% of demolition / construction waste diverted from landfill (via reuse or recycling). Lower carbon construction materials will be investigated.
Reduce peak demand for electricity	Efficient building services will be specified and installed to help reduce peak electrical demand.
Generate and store renewable energy	While photovoltaic panels could not be accommodated on the rooftops of the station buildings, TCSA has committed to Taronga Zoo being net zero carbon by 2030 and is investigating locations for photovoltaics within the broader site.
Reduce reliance on artificial lighting and mechanical heating and cooling through passive design	The majority of the project is open air and will receive natural light and ventilation. Occupied spaces will incorporate appropriate insulation and glazing to reduce reliance on artificial lighting and mechanical heating and cooling.
Meter and monitor energy consumption	Energy consumption will be metered and monitored.

Criteria	Response
Minimise consumption of potable water	Potable water consumption will be reduced through the specification of efficient fittings, fixtures, appliances, and landscaping. Major water uses will be separately metered and monitored.

Refer to Section 3 for further details.

2.3.2 C4 Net Zero Carbon Statement

A net zero carbon statement has been prepared for the project. Please refer '*1037653-CAN-SY-002 - Net Zero Statement - Rev B*'.

2.4 NSW Government Strategy

Various strategies published by the NSW Government have been considered in the development of this proposal, and responded to where appropriate, including:

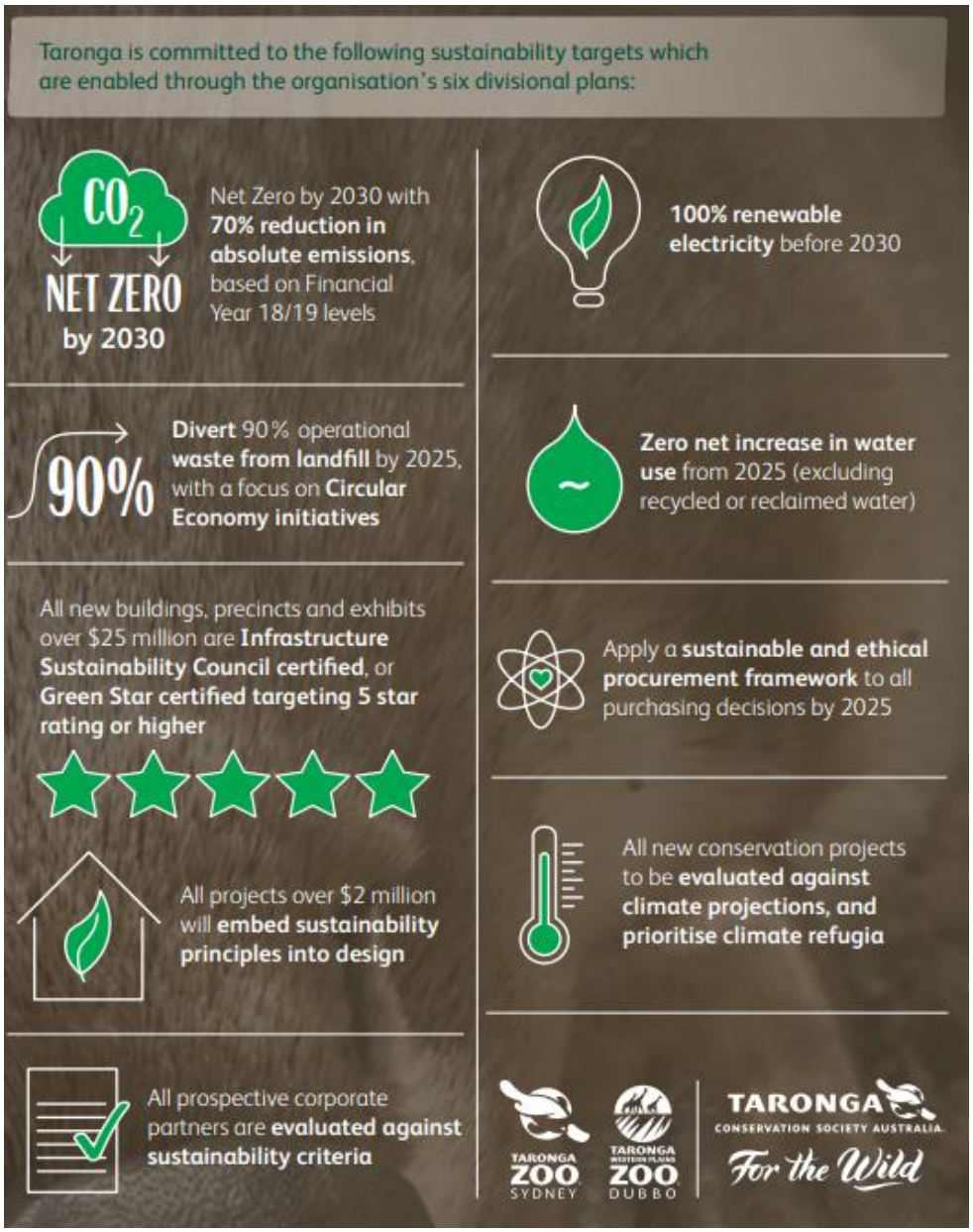
- NSW Government Net Zero Plan 2020-2030
- NSW Water Strategy & Greater Sydney Water Strategy
- NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021-2027

Responses include:

- Elimination of natural gas in building and cable car operations (except for back-up generation).
- Potable water demand will be reduced through water efficient systems, fittings, fixtures, and appliances.
- Drought resistant landscaping species will be specified.
- A minimum of 80% of construction waste will be diverted from landfill.
- Information about sustainability initiatives will be publicly displayed to engage with customers and educate them about conservation efforts.

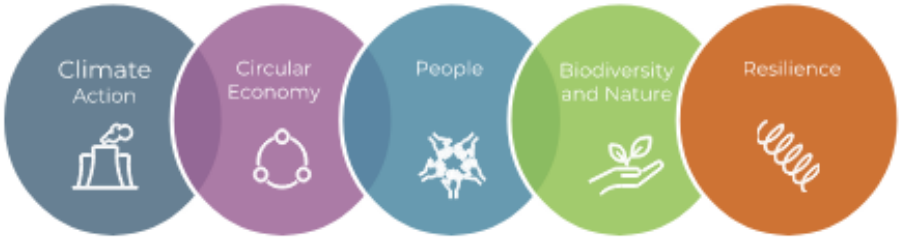
3.0 Sustainability Strategy and Framework

TCSA has developed and published a Sustainability Strategy 2021-2025, shown in the following image:



Project-specific initiatives have been developed which align with and build on TCSA's broader Sustainability Strategy, as well as responding to the SEARS and the United Nations Sustainable Development Goals (UNSDGs).

The project sustainability strategy provides an overarching framework for all sustainability aspects of the development and focuses on the following key themes.



Initiatives have been proposed to deliver on the sustainability strategy.

Development and incorporation of the initiatives will be a collaborative effort with ongoing input from the TCSA and the wider project team. The initiatives will be tracked over the lifetime of the project with measurable outcomes defined to provide positive outcomes for the environment and people.

3.1 Climate Action

Climate change is one of the most serious issues facing society and the planet today. There are significant environmental benefits to be gained by adopting a low carbon / climate positive strategy for the Sky Safari, aligned with TCSA's net zero target by 2030. The following pathway to zero carbon by 2030 will be used to guide the project design:

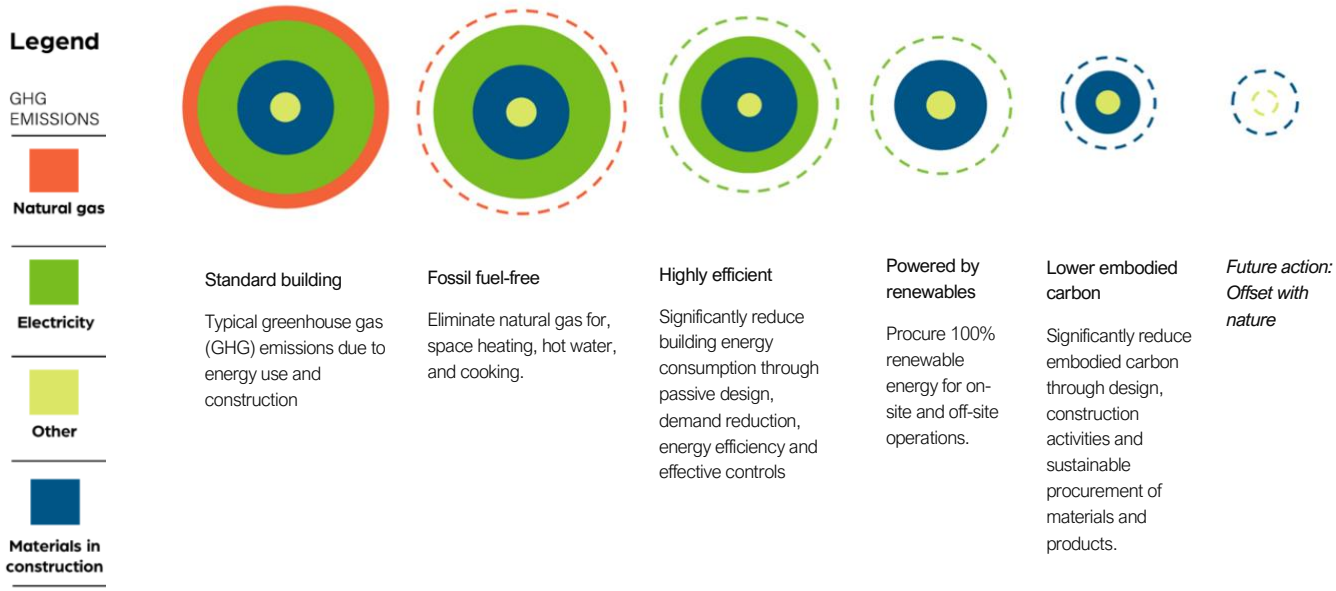


Figure 3.1: Net Zero Strategy Process

Table 3.1 below details how reasonable and feasible measures will be implemented on site to minimise the site's proposed greenhouse gas (GHG) emissions in design, construction, and ongoing operation of the development.

Table 3.1b: Climate Action Initiatives

Strategy	Proposed Initiatives
Eliminate fossil fuels	▪ No permanent natural gas connection in operation of the cable car or buildings Fossil fuels will only be used for back-up emergency power generation.
Minimise upfront carbon	▪ The following principles will be applied to material selection: - Select lower carbon materials - Select materials with a higher recycled or reused content ▪ Minimise construction carbon emissions
Reduce project operational carbon	▪ Passive design strategies will be implemented for the staff amenities room as the only conditioned space within the project, including appropriate insulation and glazing to comply with NCC Section J requirements for the conditioned building fabric. A Section J assessment will be undertaken during detailed design if required. ▪ Efficient building services, systems, and equipment will be specified and installed, including: - LED lighting with efficiency controls. - Efficient air-conditioning. - Investigate operational energy saving measures for the cable car operation. ▪ Minimal conditioned spaces – queuing areas are open to outside and are not temperature controlled.
Renewable energy generation & storage	▪ All electricity will be procured from 100% renewable energy sources
Reduce other emissions	▪ Minimise waste and wastewater ▪ Specify lower global warming potential (GWP) refrigerants
Management	▪ Comprehensive Commissioning and Tuning will be undertaken for the nominated building systems. ▪ Environmental impacts during construction will be managed by implementing a best practice, site specific construction environmental management plan. ▪ Submetering and monitoring of major energy uses.

3.2 Circular Economy

A circular economy keeps resources and materials in use for as long as possible at their highest value. It maximises their usability and then recovers, regenerates and/or repurposes them in a closed loop. The principles of a circular economy require a focus on responsible material procurement and waste minimisation in design, construction, operation, and end-of life.

Table 3.2: Circular Economy Initiatives

Strategy	Proposed Initiatives
Design considerations	▪ Investigate reuse of existing materials from site e.g. soils, stone and vegetation ▪ Consider dematerialisation in design and construction, including prefabricated components. ▪ Select recycled, reused, non-toxic and rapidly renewable products and materials that can be reused/recycled at end of life. Consider: - Precast concrete construction to minimise construction waste. - Investigate products / materials which are more responsible, including those with environmental certifications. - Investigate concrete products with reduced use of Portland cement, reuse of reclaimed mix water, and reduced impact aggregates (crushed slag, manufactured sand etc) - Retain and recycling quarried sandstone, to be used for public domain seating elements and crushed aggregate. ▪ Design for durability ▪ Investigate local sourcing of landscaping and civil works materials.
Construction	▪ Divert a minimum of 80% of construction and demolition waste from landfill

3.3 People and Community

People and community are a key driver for the project. Initiatives to improve the wellbeing of staff and visitors, and to positively contribute to the community, are outline in Table 3.3.

Table 3.3: People and Community Initiatives

Strategy	Proposed Initiatives
Provide better environments for people	▪ Optimal cable car incline angle to optimise occupant comfort. ▪ 100% occupant-controlled daylight and natural ventilation for occupied areas ▪ Artificial lighting strategy will be designed to maintain appropriate illuminance levels and glare reduction in staff and public amenities spaces. ▪ Low VOC finishes and low formaldehyde engineered wood products will be specified in occupied enclosed areas to minimise off-gassing.
Inclusive design	▪ Design ramps and pathways for ease of accessibility and inclusion.
Zero modern slavery in the supply chain	▪ Seek to use products/materials and labour with transparent, ethical supply chains
Respect and develop local community during construction and operation	▪ Connection to Country and Culture: The following consultation occurred during initial Concept Design: – Fellingham Consultancy and Design (FCAD) – Taronga Aboriginal Advisory Group, Cammeraigal (TAAG) ▪ Key First Nations Engagement: established at project outset. ▪ Designing with Country Approach: From Saltwater to Sky. ▪ Ongoing consultation with relevant Indigenous staff, Community and Advisory Groups. ▪ Development procurement and contract process that supports First Nations opportunities. ▪ Ensuring Aboriginal Participation within tender process. ▪ Developing Taronga's Cultural Ways of Working Framework to inform future approaches.
Minimise negative impact on environment during construction & operation	▪ Construct and operate in line with approved Environmental Management Plans. ▪ Night sky pollution will be considered in the external lighting design.
Education and engagement	▪ Educational materials for passengers regarding Connection to Country, conservation. and sustainability. ▪ Providing education programs that foster the next generation of conservationists, from pre-school to PhD. ▪ Interpretative design elements will be provided within the architecture and public domain, through active and passive signage and wayfinding and art overlays.

3.4 Biodiversity and Nature

The development of the site will strive to minimise negative impacts on biodiversity. This includes focusing on the existing biodiversity within the zoo as well as protecting water bodies and constructively reusing water from natural sources.

Table 3.4: Biodiversity and Nature Initiatives

Strategy	Proposed Initiatives
Efficient water use and monitoring	▪ Water-efficient fittings, fixtures and appliances will be specified in amenities and staff room ▪ Drought-resistant landscape species will be specified. ▪ Metering and monitoring of major water uses.
Minimise stormwater pollution and peak runoff through Water sensitive urban design (WSUD)	▪ Water Sensitive Urban Design principles are being adopted in the landscape / civil design to minimise stormwater runoff and control runoff pollution loads. ▪ Incorporate pervious surfaces where practical.
Maintain biodiversity on site compared to pre-development conditions	▪ Onsite landscaping with indigenous, low water use, drought resistant plant species ▪ Landscaping Designed for Country ▪ Maintain biodiversity value of the site area

3.5 Resilience

Resilience takes into consideration the capacity of individuals, communities, institutions, business, and systems to survive, adapt and grow no matter what kinds of chronic stresses and acute shocks they experience. Adaptation is the process of building more resilient communities, institutions, businesses, and systems to a given (anticipated) set of shocks and stresses.

- A stress is a long-term pressure that reduces the ability of the building to operate in an ideal manner.
- A shock is a short-term, sudden, impact that causes the operations of the building to deviate significantly from its ideal.

Resilience can be divided into four key categorises. These are natural, social, economic, and the built environment.

Strategies will be developed to mitigate risks associated with an increase in extreme climate events related to rising temperatures, extreme storms, and bushfires.

4.0 NCC Section J

The project's conditioned occupied spaces will comply with NCC 2022 Section J energy efficiency requirements including building fabric (J1), building sealing (J3), air-conditioning and ventilation systems (J5), artificial lighting and power (J6), heated water supply (J7) and facilities for energy monitoring (J8).

Assessment of conditioned building fabric against the Deemed-To-Satisfy provisions of Section J will be undertaken during detailed design if relevant.

5.0 Conclusion

This report concludes that the proposed sky safari development is suitable and warrants approval subject to the implementation of the following mitigation measures:

- Minimise operational energy use in the buildings through efficient air-conditioning and lighting.
- Minimise operational energy use in cable car operation.
- 100% renewable electricity will be procured and used throughout the site.
- Reduce upfront carbon used in the buildings and civil works.
- Responsible management of stormwater pollution and runoff.
- Procurement of more responsible materials, including certified products and those with a higher recycled content.
- Waste minimization plan implemented to reduce waste to landfill during demolition, construction, and operation.

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

The initiatives will be tracked over the lifetime of the project with measurable outcomes defined to provide positive outcomes for the environment and people.

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Consultant's Advice Notice

Project:	Taronga Sky Safari	**Job No:**	1037653
Subject:	Net Zero Statement	**Date:**	24/02/2025
Attention:	Taronga Conservation Society Australia	**Revision:**	B

1.0 Introduction

This Net Zero Statement has been prepared to outline how the Taronga Zoo Cable Car Revitalisation Project (hereafter referred to as the 'Sky Safari') will reduce its dependence on fossil fuels and be capable of operating at net zero emissions by 2035.

It addresses the requirements under the NSW Sustainable Buildings SEPP dated 05/04/2024, as per clause 35C of the Environmental Planning and Assessment Act Regulation and provides an assessment of development-appropriate measures that the project will implement in design and operation.

2.0 Project Description

A revitalised Sky Safari, with an easily accessible bird's-eye view over Taronga Zoo and surrounding Sydney Harbour National Park. This will be a global icon showcasing the splendour of Sydney Harbour from "the Heads" in the east to the Blue Mountains in the west and south to the sparkling city skyline.

The new Sky Safari will attract new and repeat visitors to Taronga Zoo Sydney by elevating the overall integrated zoo product and experience, offering:

- An iconic cable car ride giving guests panoramic views and the most scenic way to experience the most beautiful natural harbour in the world.
- A unique view of some of the Zoo's 4000 animals in their iconic Sydney home.
- A spectacular and accessible "hop on and hop off" way to move guests of all ages and abilities conveniently around different parts of the zoo and especially from the wharf to the main entrance.

The new product will drive specific Sky Safari volume and yield by creating an attraction that could stand alone outside Zoo Admission, offering:

- Cable car + element – an 'add on' spectacular sensory experience that enhances either our wildlife/indigenous story and/or our iconic harbour location and view.
- Potential to bundle with other Sydney attractions.

3.0 Net Zero Design Initiatives

The table below details how reasonable and feasible measures will be implemented on site to reduce the site's greenhouse gas emissions by 70 per cent by 2035 compared to 2005 levels and reach net zero emissions by 2050.

Table 1: Net zero design initiatives

Strategy	Proposed Initiatives
Eliminate fossil fuels	▪ No permanent natural gas connection in operation of the cable car or buildings Fossil fuels will only be used for back-up emergency power generation.
Minimise upfront carbon	▪ The following principles will be applied to material selection: - Select lower carbon materials - Select materials with a higher recycled or reused content ▪ Minimise construction carbon emissions
Reduce project operational carbon	▪ Passive design strategies will be implemented for the staff amenities room as the only conditioned space within the project, including appropriate insulation and glazing to comply with NCC Section J requirements for the conditioned building fabric. A Section J assessment will be undertaken during detailed design. ▪ Efficient building services, systems, and equipment will be specified and installed, including: - LED lighting with efficiency controls. - Efficient air-conditioning. - Investigate operational energy saving measures for the cable car operation. ▪ Minimal conditioned spaces – queuing areas are open to outside and are not temperature controlled.
Renewable energy generation & storage	▪ All electricity will be procured from 100% renewable energy sources. ▪ While photovoltaic panels could not be accommodated on the rooftops of the station buildings, TCSA has committed to Taronga Zoo being net zero carbon by 2030 and is investigating locations for photovoltaics within the broader site.
Reduce other emissions	▪ Minimise waste and wastewater. ▪ Specify lower global warming potential (GWP) refrigerants.
Management	▪ Comprehensive Commissioning and Tuning will be undertaken for the nominated building systems. ▪ Environmental impacts during construction will be managed by implementing a best practice, site specific construction environmental management plan. ▪ Submetering and monitoring of major energy uses.

4.0 Greenhouse Gas Emissions Estimate

4.1 Emissions Scope and Coverage

Under this assessment, the following emissions scope has been assessed:

- Scope 1 – Related to direct emissions from sources within the boundary of the Project.
- Scope 2 – Related to the emissions resulting from the consumption of imported electricity from the local electricity grid.
- Scope 3 – Related to the indirect emissions attributable to losses through the electricity transmissions and distribution network.

Sources of emissions estimated in this assessment include the following:

- Imported electricity consumed in the operation of the facility; and
- On-site diesel fuel consumption consumed in the monthly testing of backup diesel generators.

Emissions have been estimated on an annual basis under the assumption of full and ultimate operational capacity over a 50-year period from 2025 (i.e., conservatively ignoring phased fit out and load growth which are difficult to predict accurately).

4.1.1 GHG emissions within each scope category

Table 2: Emission Sources at Scopes 1,2, and 3

Scope	Inclusions
Scope 1	▪ Refrigerants (for cooling systems) ▪ Diesel (for backup electricity)
Scope 2	▪ Electricity consumption or purchase for building operations
Scope 3	▪ Indirect GHG emissions (i.e. computing equipment)

4.2 Input Data

Emissions factors used for the estimation of GHG emissions has been taken from the National Greenhouse Accounts Factors 2022 (published February 2023), published by the Australian Government Department of Climate Change, Energy, the Environment and Water. At the time of writing, this was the latest revision of these accounts' factors, and it is assumed that they are applicable to the estimates at commencement of operation.

Emissions factors associated with relevant sources for the Project are outlined in Table 3 below.

Table 3: Emissions taken from National Greenhouse Accounts Factors 2022 (published Feb 2023)

Diesel Fuel	Scope 1: CO_2: 69.9 kgCO_2-e/GJ (2698.1 kgCO_2-e/kL) CH_4: 0.1 kgCO_2-e/GJ (3.9 kgCO_2-e/kL) N_2O: 0.2 kgCO_2-e/GJ (7.7 kgCO_2-e/kL) Total: 70.2 kgCO_2-e/GJ (2,709.7 kgCO_2-e/kL)
NSW Grid Electricity	Scope 2: 0.73 kgCO_2-e/kWh Scope 3: 0.06 kgCO_2-e/kWh
Biodiesel Fuel	Scope 1: CO2: 0.0 kgCO2-e/GJ CH4: 0.08 kg CO2-e/GJ N2O: 0.2 kgCO2-e/GJ Total: 0.28 kgCO_2-e/GJ

The decarbonisation of the electricity grid has been estimated based on linear interpolation and extrapolation of publicly announced government commitments related to renewable energy targets. Emission for the generation of electricity is projected to decline with increased renewable energy supply while emissions for distribution losses are held constant (as a conservative assumption, although likely also to decline) up to the net zero carbon target of 2050.

The proposed generator can use biodiesel when a suitable supply becomes available in Sydney, therefore conservatively estimated the changeover from diesel to biodiesel to be 2050. Figure 1 illustrates the assumed changes to these factors notionally between 2025 and 2075.

The figure overleaf identifies the emission factors associated with the assessment that follows.

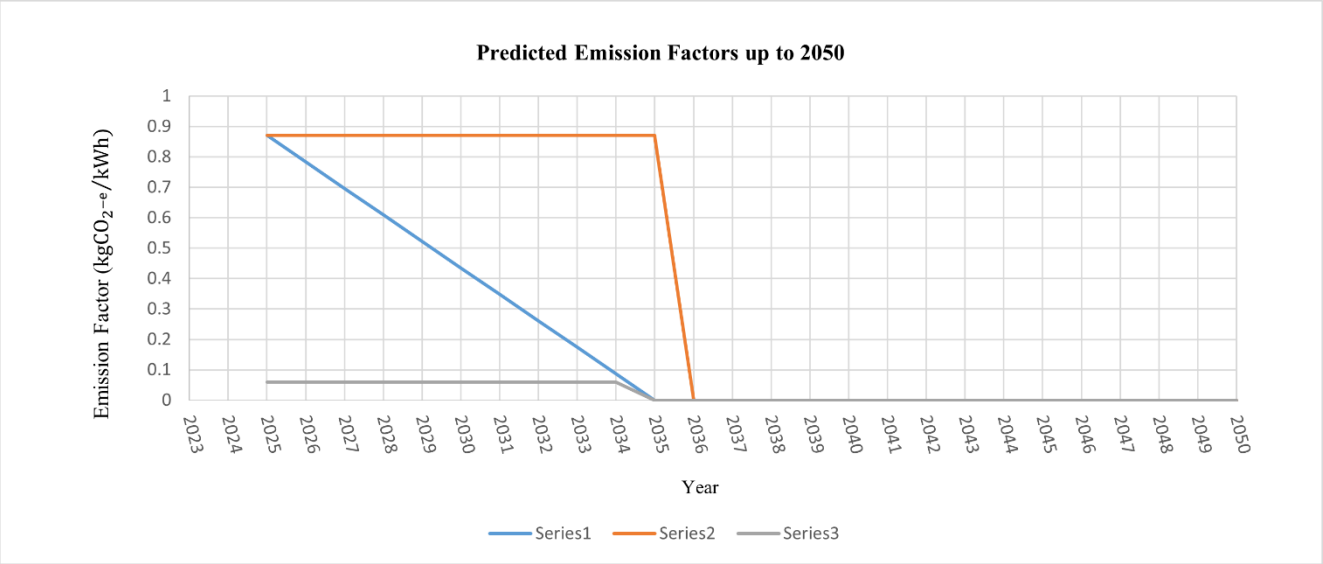

Figure 1: Projected emissions factor for diesel and grid electricity for the life of the asset

Note, as the generator models, fuel consumption, and testing load are currently unknown the total emissions from the backup generators will be determined during detailed design.

4.2.1 Backup Generators

Generators are tested for operational readiness based on the following regime:

Table 4: Generator testing frequency and loads

Testing Frequency	Time (min)	Load	Total hours
Weekly	30	100%	26

The fuel consumption rates of each generator are shown in Table 5 below:

Table 5: Generator fuel consumption rates taken from CAT and MTU generator datasheets

Generator (kW)	Brand/Model	75% Load Fuel Consumption (L/hr)	100% Load Fuel Consumption (L/hr)
325	MTU/6R0225 DS350	77.9	104.1

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4.4 Estimated Energy Consumption

The Applicant has committed to attaining a suitable standard of energy use for the development.

Category	Consumption (kWh)
Estimated fossil fuel consumption per year	48.08
Estimated electricity consumption per year	1,629,630
Estimated additional electricity for lighting	34,785
Estimated total net grid electricity used on site	1,664,415
Estimated energy consumption per year kWh/m2 of GFA	1,242.10

4.5 Estimated GHG emissions for energy use

The estimated annual scope 1, 2 and 3 emissions are as follows:

Category	Emissions (tCO_2-e)
Estimated direct (scope 1) GHG emissions per year	14,642.89
Estimated indirect (scope 2 and 3) GHG emissions per year	1,314,849.68
Total estimated GHG emissions per year	1,329,492.54

Yours sincerely,
For and on behalf of
Cundall Johnston and Partners Pty Ltd

Associate Director

BEng Photovoltaic & Solar Energy Engineering

Chartered Engineer (MIEAust CPEng APEC Engineer IntPE (Aus))