Sydney Zoo SSD 7228
Environmental Impact Statement

Sydney Zoo
Bungarribee Park (Western Sydney Parklands)

Submitted to the Department of Environment and Planning on behalf of Sydney Zoo

December 2015 ▪ 15247

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This report has been prepared by
Tim Ward and Christopher Curtis:

7/12/2015

This report has been reviewed by
Julie Bindon:

7/12/2015

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Statement of Validity

Development Application Details		
Applicant name	Sydney Zoo	
Applicant address	C/- Sturt Capital Partners, Level 6, 1 Alfred Street, Sydney	
Land to be developed	Lot 101 on DP1195067	
Proposed development	A zoological facility as described in Section 3.0 of this Environmental Impact Statement	
Prepared by		
Name	Tim Ward	Christopher Curtis
Qualifications	BSC(Hons) MEnvMgt	BUrbanEnvPlan (Hons)
Address	Level 7, 77 Berry Street, North Sydney	
In respect of	State Significant Development - Development Application	

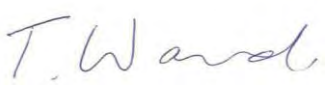
Certification

I certify that I have prepared the content of this EIS and to the best of my knowledge:

it is in accordance with Schedule 2 of the Environmental Planning and Assessment Regulation 2000;

all available information that is relevant to the environmental assessment of the development to which the statement relates; and

the information contained in the statement is neither false nor misleading.

Signature		
Name	Tim Ward	Christopher Curtis
Date	7/12/2015	7/12/2015

Executive Summary

Purpose of this Report

This Environmental Impact Statement (EIS) is submitted to the Department of Planning and Environment (the Department) as part of a Development Application under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP& A Act). It relates to a proposal for a new zoological facility situated within the Western Sydney Parklands (Sydney Zoo).

Development within the Western Parklands with a capital investment value of more than $10 million is State Significant Development (SSD) for the purposes of the EP&A Act. As the proposed development will have a capital investment value of $28 million it is SSD.

A request for the issue of Secretary's Environmental Assessment Requirements (SEARs) was sought on 14 August 2015. Accordingly, the SEARs were issued on 16 September 2015. This submission is in accordance with the Department's guidelines for SSD applications lodged under Part 4 of the EP&A Act, and addresses the issues raised in the SEARs.

Overview of the Project

The Development Application (DA) seeks approval for the following key components of the Sydney Zoo:

- Animal exhibits across several enclosures of varying design for a range of native and exotic animals;
- Back-of-house buildings for exhibits;
- Main entrance building comprising entry/exit, and gift shop;
- Restaurant and café;
- Kiosks and amenities;
- Show arena;
- Picnic areas and gardens;
- Wetlands and waterways;
- Service building containing:
  - Administration areas;
  - Curatorial and food preparation areas; and
  - Veterinarian space.
- Signage;
- Service yard with maintenance shelter;
- Internal services and utilities to support the Zoo, including water, sewer, electricity and telecommunications;
- Main car park for approximately 475 vehicles, with an overflow car park for approximately 840 vehicles (accessed via an internal road connecting to the Great Western Highway);
- Bus and coach parking;
- Subdivision; and
- Landscaping of the site associated with all of the above.

The Site

The site is located approximately 33 kilometres west of the Sydney Central Business District and approximately 15 kilometres east of Penrith. It falls within the Western Sydney Parklands, and is in close proximity to the Great Western Highway, M4 Western Motorway and Westlink M7, providing excellent access to both the state and regional road network and surrounding parkland areas.

The site is part of the lot legally described as Proposed Lot 11 in Lot 101 on DP1195067 (subject to subdivision as part of this SSD application), and is owned by the Western Sydney Parklands Trust. The site of the proposed Zoo is 16.5ha in size, and irregular in shape. Access will be from the Great Western Highway approximately 75m from its southern border.

Planning Context

Section 5 of the EIS considers all applicable legislation in detail. The proposal is consistent with the requirements of all relevant State Environmental Planning Policies (SEPPs). Under the Western Sydney Parklands SEPP the land is unzoned. This allows for all development to be either permissible with development consent or permissible without development consent. Development that is proposed by anyone other than a public authority requires development consent. As the proponent is not a public authority, development consent is required under the EP&A Act.

Environmental Impacts and Mitigation Measures

This EIS provides an assessment of the environmental impacts of the project in accordance with the SEARs and sets out the undertakings made by Sydney Zoo to manage and minimise potential impacts arising from the development.

Air quality and odour

The proposed Zoo may have impacts on air quality during construction, from activities associated with the bulk earthworks phase which is anticipated to last for between three and four months. Appropriate construction management measures will be implemented to minimise these impacts on the nearby sensitive receivers. Odour stemming from the composting and storage of organic waste has been assessed and determined to pose a negligible impact on neighbouring receptors. Appropriate management measures will be incorporated into the operational phase of the Zoo.

Noise and vibration

There are potential impacts resulting from construction of the proposed Zoo which may affect nearby sensitive receivers during the main bulk earthworks phase. Additionally, noise impacts associated with the construction period, and the operational period, particularly related to sleep disturbance from roaring lions, has been assessed which indicates that there will be negligible impact on neighbouring residential properties due to the separation distances provided by the buffer of the wider Western Sydney Parklands.

Traffic, transport and access

The Zoo has provided an assessment which indicates that the existing road network is sufficient to handle off-peak, shoulder and peak periods of patronage, which will be variable dependant on the time of year. Accordingly, no upgrades to the adjacent Great Western Highway or Doonside Road are required.

Landscape character and visual impact

The proposed Zoo has been designed to integrate into the existing environment through the use of landscaping and architectural design, which reflects the future

desired built form of the wider Bungarribee Precinct under the Western Sydney Parklands Plan of Management. The use of vegetation will allow for the Zoo to present a contiguous appearance when viewing in the context of the wider Parkland area.

Conclusion and Justification

The EIS addresses the SEARs, and the proposal provides for the proposed Sydney Zoo. The potential impacts of the development are acceptable and are able to be managed as outlined within the safeguard and mitigation measures contained within this EIS and its appended technical reports. Given the planning merits of the proposal, the proposed development warrants approval by the Minister for Planning and Environment.

1.0 Introduction

This Environmental Impact Statement (EIS) is submitted to the Department of Planning and Environment (the Department) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in support of an application for State Significant Development (SSD).

The report has been prepared by JBA on behalf of Sydney Zoo, and is based on the Landscape Master Plan and Architectural Drawings provided by Aspect and Misho Architects (see **Appendix B** and **Appendix C** respectively) and other supporting technical information appended to the report (see Table of Contents).

This EIS has been prepared in accordance with the requirements of Part 4 of the EP&A Act, Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation), and the Requirements of the Secretary of the Department of Planning and Environment for the preparation of the EIS, which are included at **Appendix D**. This EIS should be read in conjunction with the supporting information and plans appended to and accompanying this report.

1.1 Overview of the Project

The proposed development will provide a new recreational facility for Western Sydney. The proposal will comprise a Zoo containing animal exhibits and associated infrastructure over the site, being a total area of approximately 16.5ha, for the following key components:

- Animal exhibits across several enclosures of varying design for a range of native and exotic animals;
- Back-of-house buildings for exhibits;
- Main entrance building comprising entry/exit, and gift shop;
- Restaurant and café;
- Kiosks and amenities;
- Show arena;
- Picnic areas and gardens;
- Wetlands and waterways;
- Service building containing:
  - Administration areas;
  - Curatorial and food preparation areas; and
  - Veterinarian space.
- Signage;
- Service yard with maintenance shelter;
- Internal services and utilities to support the Zoo, including water, sewer, electricity and telecommunications;
- Main car park for approximately 475 vehicles, with an overflow car park for approximately 840 vehicles (accessed via an internal road connecting to the Great Western Highway);
- Bus and coach parking;
- Subdivision; and
- Landscaping of the site associated with all of the above.

An indicative layout of the proposed Zoo is provided in **Figure 8**. Approximately 40% of the area will be occupied by impermeable surfaces (roofs, paths, car parks) with the rest of the area being vegetated and park-like, offering a continuation of the green corridor being developed as part of the adjoining Western Sydney Parklands.

It is estimated that between 500,000 to 800,000 visitors per annum would visit the proposed Zoo, which is intended to be a 2.5 to 3 hour visitor experience. Visitation to the Zoo will not be uniform, and will vary depending on the time of year.

1.2 Background to the Project

The site is within the Western Sydney Parklands. The master plan for the Western Sydney Parklands outlines the desire for the site to become a recreational destination as part of the broader Bungarribee Super Park Precinct. To achieve this, the Western Sydney Parklands Trust (WSPT) invited prospective proponents to submit responses to a Request for Proposals to provide a tourism facility within the Bungarribee Precinct of the Western Sydney Parklands. Sydney Zoo was the successful tenderer, and entered into a lease agreement with the WSPT on 5 December 2014.

WSPT remains the owner of the site. WSPT is a semi-autonomous statutory authority of the NSW Government, established and maintained under the *Western Sydney Parklands Act 2006*.

1.3 Objectives of the Project

The vision for Sydney Zoo is to create an iconic tourist attraction which complements the overall masterplan for the Bungarribee Precinct of the Western Sydney Parklands. The Zoo will be an important part of the cultural infrastructure for the region and wider Sydney area through:

- provision of educational programs for the public focusing on the natural and cultural heritage of Western Sydney;
- providing for a high level of information and education about species conservation to enable visitors to understand first-hand about living with animals;
- ensuring the built form and structure of the Zoo will have as minimal visual impacts as possible on the wider Bungarribee Precinct; and
- establishment of a key destination and tourist facility in the growing Western Sydney region, building on key transport and infrastructure links.

1.4 Structure of this Report

The EIS provides the following sections:

- Section 2 Site Analysis: Provides a description of the site, the regional and local context and surrounding development
- Section 3 Description of the Project: Provides a description of the proposal
- Section 4 Consultation: Outlines the consultation undertaken during the preparation of this EIS
- Section 5 Statutory and Strategic Context: Provides a detailed review of the project against the relevant planning framework
- Section 6 Environmental Assessment: Provides an in-depth assessment of the existing environment, potential impacts and the mitigation measures for each

key area of impact identified within the Secretary's Environmental Assessment Requirements (SEARs).

- Section 7 Environmental Risk Assessment: Provides a detailed environmental risk assessment of the proposed Zoo
- Section 8 Mitigation Measures: Provides a list of recommendations and mitigation measures based on the technical studies undertaken
- Section 9 Justification of the Proposal: Outlines the justification behind the proposal based on the assessment within this EIS
- Section 10 Conclusion
- Appendix A Consideration of Clause 228(2) Factors and Matters of National Environmental Significance: Provides an assessment against the relevant clauses of the *Environmental Protection and Assessment Act 1979*

Technical studies prepared to support this EIS are appended to this report.

1.5 Project Team

An expert project team has been formed to deliver the project and includes the consultants listed in **Table 1**.

Table 1 – Project team

Consultant	Role
Sydney Zoo	Applicant
JBA	Urban Planning Community Engagement
ASPECT Studios	Master Planning
Misho + Associates	Architecture
Lindsay Dynan	Civil Engineering Structural Engineering
Evolved Engineering	Mechanical Engineering
Ecological	Vegetation and Biodiversity
Artefact	Aboriginal and Historical Cultural Heritage
Wilkinson Murray	Noise and Air Quality
SLR Consulting	Ecologically Sustainable Development Waste Management
BCA Logic	Building Code of Australia Accessibility
GTA	Traffic and Transport
Consulting Earth Scientists	Site Contamination
LAS Consultants	Lighting
Urban and Public	Signage
KPMG	Economic Impact Assessment

1.6 Secretary's Environmental Assessment Requirements

In accordance with section 89G of the EP&A Act, the Secretary of the Department of Planning and Environment issued the requirements for the preparation of the EIS on 16 September 2015 with further additions received from Roads and Maritime Services on 23 September 2015. A copy of the Secretary's Environmental Assessment Requirements (SEARs) is included at **Appendix D**, with **Section 4.2** providing further description of referral agency requirements and specific responses to referral agency requirements.

Table 2 provides a detailed summary of the individual matters listed in the SEARs and identifies where each of these requirements has been addressed in this report and the accompanying technical studies.

Table 2 – Secretary's Environmental Assessment Requirements

Requirement	Location in Environmental Assessment	
General		
The Environmental Impact Statement (EIS) must address the *Environmental Planning and Assessment Act 1979* and meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 the Environmental Planning and Assessment Regulation 2000.	Main EIS Report	
A detailed description of the development	Section 3.0	
Consideration of all relevant guidelines and environmental planning instruments, including identification and justification of any inconsistencies with these instruments	Section 5.0	
A risk assessment of any potential environmental impacts of the development, identifying the key issues for further assessment	Section 7.0	
A detailed assessment of the key issues specified below and any other significant issues identified in this risk assessment: ▪ adequate baseline data; ▪ consideration of potential cumulative impacts due to other development in the vicinity; and ▪ measures to avoid, minimise and if necessary, offset the predicted impacts, including detailed contingency plans for managing any significant risks to the environment.	Section 6.0	
The EIS must be accompanied by a report from a qualified quantity surveyor providing: ▪ a detailed calculation of the capital investment value (CIV) (as defined in clause 3 of the Environmental Planning and Assessment Regulation 2000) of the proposal, including details of all assumptions and components from which the CIV calculation is derived; ▪ a close estimate of the jobs that will be created by the development during the construction and operational phases of the development; and ▪ certification that the information provided is accurate at the date of preparation.	The proposed Zoo has an approximate CIV of $28 million. The CIV will be provided to the Department of Planning and Environment under separate cover.	
Key Issues		
Air and Odour	**Report / EIS**	**Technical Study**
A quantitative air quality assessment of the air quality and odour impacts of the proposed development including impacts on any surrounding receivers.	Section 6.1	Appendix O
Details of the air emissions during both construction and operation	Section 6.1	Appendix O
Identification of all pollutants of concern	Section 6.1	Appendix O
Quantitative assessment of all potential impacts using dispersion modelling, including adequate justification and validation of all model inputs and outputs	Section 6.1	Appendix O
Cumulative assessment of all existing and proposed emission sources	Section 6.1	Appendix O
Details of the proposed management and monitoring measures	Section 6.1	Appendix O
Noise and Vibration	**Report / EIS**	**Technical Study**
An assessment of all construction, operational and transportation noise and vibration impacts, including impacts on nearby sensitive receivers	Section 6.2	Appendix N
Cumulative impacts of other developments both on the site and in the vicinity of the site	Section 6.2	Appendix N
Details of the proposed noise management and monitoring measures	Section 6.2	Appendix N
Animal welfare, bio-security and disease management	**Report / EIS**	**Technical Study**
Details of how the proposed development would comply with relevant animal welfare, bio-security and disease management codes and guidelines	Section 5.1.3	-
Details of all disease control measures	Section 3.0	-
A detailed description of the contingency measures that would be implemented for any required disposal of animals in the event of a disease	Section 3.11.6	-

Requirement	Location in Environmental Assessment	
outbreak		
Transport, Access and Parking	**Report / EIS**	**Technical Study**
A detailed traffic assessment undertake by a suitably qualified person that includes: ▪ consultation with NSW Roads and Maritime Services, Transport for NSW, Blacktown City Council and any other providers of public transport ▪ accurate predictions of the traffic generated by the development during construction and operation, including during peak visitor periods ▪ a detailed assessment of the potential impacts of the development on the capacity, efficiency and safety of the road network during construction and operation, including the truck routes, cumulative traffic generated by the existing and proposed development ▪ details of any required upgrades to road infrastructure ▪ details of surrounding public transport and any upgrades or changes in services required for the development ▪ details of access, internal roads and vehicular parking required as a result of the development Roads and Maritime require the following issues to be included ▪ Daily peak and peak traffic movements likely to be generated by the proposed development including the impact on nearby intersections and the need/associated funding for upgrading or road improvement works (if required) ▪ Details of the proposed accesses and the parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standards (i.e.: turn paths, sight distance requirements aisle widths, etc.) ▪ Proposed number of car parking spaces and compliance with the appropriate parking codes ▪ Details of service vehicle movements (including vehicle type and likely arrival and departure times) ▪ Roads and Maritime will require in due course the provision of a traffic management plan for all demolition/construction activities, detailing vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures	Section 6.3	Appendix E
Soil and Water	**Report / EIS**	**Technical Study**
An assessment of the potential soil, groundwater and surface water impacts of the proposal during construction and operation	Section 6.4	Appendix F
Details of water supply including any water licensing requirements or other approvals under the *Water Act 1912* and/or the *Water Management Act 2000*	Section 6.4	Appendix F
A detailed water balance for the development, outlining the measures to minimise water use and any potential for a sustainable water supply	Section 6.4	Appendix F
Wastewater predictions, and the measures that would be implemented to treat, reuse and/or dispose of this water	Section 6.4	Appendix F
Details of the existing and proposed wastewater management system	Section 6.4	Appendix F
Heritage	**Report / EIS**	**Technical Study**
An Aboriginal cultural heritage assessment prepared by a suitably qualified archaeologist (including cultural and archaeological significance) which must demonstrate effective consultation with relevant Aboriginal community groups	Section 6.5	Appendix M
A non-Aboriginal cultural heritage assessment prepared by a suitably qualified archaeologist (including both cultural and archaeological significance) which must detail potential impacts on heritage assets and any proposed management and mitigation measures of the potential impacts of vibration on heritage items	Section 6.6	Appendix L
Waste	**Report / EIS**	**Technical Study**
Identification of the quantity and type of waste that would be handled, stored, processed or disposed of at the site	Section 6.7	Appendix Q

Requirement	Location in Environmental Assessment	
A description of the waste processing and recycling measures, timeframes for processing and recycling and the quality control measures that would be implemented	Section 6.7	Appendix Q
Details of the potential impacts associated with treating, storing, using and disposing of any waste and waste products	Section 6.7	Appendix Q
Design and Visual	**Report / EIS**	**Technical Study**
Layout of the development including staging, site coverage, setbacks, proposed open space and landscaped areas	Section 3.0	Appendix B
Details of suitable landscaping incorporating endemic species	Section 3.0	Appendix B
A detailed description (including photomontages and perspectives) of the zoo (enclosures, recreational areas, buildings and any storage areas) including height, colour, scale, building materials and finishes, signage and lighting, particularly from: ▪ Nearby receivers ▪ Significant vantage points of the broader public domain	Section 3.0	Appendix B Appendix C
The layout and design of the development having regard to the surrounding vehicular, pedestrian and cycling networks	Section 3.0	Appendix B
Contamination	**Report / EIS**	**Technical Study**
An assessment of any potential site contamination and details of all potential contamination sources	Section 6.9	Appendix H
Identification of any contaminated soil likely to be impacted by the development	Section 6.9	Appendix H
Proposed measures to be implemented in the event that soil contamination is encountered	Section 6.9	Appendix H
Details of remediation and management for the proposed development (if required)	Section 6.9	Appendix H
Biodiversity	**Report / EIS**	**Technical Study**
Identification of species on-site	Section 6.10	Appendix I
Detail of the potential direct and indirect impacts on any threatened species, populations, endangered ecological communities or their habitats, groundwater dependant ecosystems and any potential for offset requirements	Section 6.10	Appendix I
A detailed description of the measures to avoid, minimise, mitigate and offset biodiversity impacts	Section 6.10	Appendix I
An assessment of the proposal and all biodiversity values on the site under the *Framework for Biodiversity Assessment 2014*	Section 6.10	Appendix I
Hazards and Risks	**Report / EIS**	**Technical Study**
A preliminary risk screening in accordance with *State Environmental Planning Policy No.33 – Hazardous and Offensive Development*, and *Applying SEPP 33* (DoP, 2011), with a clear indication of class, quantity, package size, and location of all dangerous goods and hazardous materials associated with the proposal	Section 6.12	-
Should the preliminary risk screening indicate that the project is 'potentially hazardous', a Preliminary Hazard Analysis (PHA) must be prepared in accordance with *Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis* (DoP, 2011), and *Multi-Level Risk Assessment* (DoP, 2011). The PHA must: ▪ Identify the hazards associated with the proposal to determine the potential for off-site impacts ▪ Estimate the combined risks from the existing site and the proposed development (overall site); and ▪ Demonstrate that the risks from the overall site (as modified by this proposal) comply with the criteria set out in Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning	Section 6.12	-
Bushfire and Incident Management	**Report / EIS**	**Technical Study**
Including technical information on the environmental protection equipment to be installed on the premises such as air, water and noise controls, spill clean-up equipment and fire management and containment measures	Section 6.11	Appendix J

Requirement	Location in Environmental Assessment	
Greenhouse Gas Emissions	**Report / EIS**	**Technical Study**
A quantitative assessment of the potential scope 1 and 2 greenhouse gas emissions from the development, and a qualitative assessment of the potential impacts of these emissions on the environment	Section 6.13	Appendix R
A detailed description of the proposed measures that would be implemented on the site to ensure that the development is energy efficient	Section 6.13	Appendix R
Plans and Documents	**Report / EIS**	**Technical Study**
The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Environmental Planning and Assessment Regulation 2000. Provide these as part of the EIS rather than as separate documents. In addition, the EIS must include the following: ▪ An existing site survey plan ▪ A locality/context plan ▪ Drawings of detailed plans, sections and elevations of the existing building, including all proposed internal and external alterations and additions	N/A	Appendix B Appendix C
Consultation	**Report / EIS**	**Technical Study**
During preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with: ▪ Western Sydney Parklands ▪ Blacktown City Council ▪ Department of Primary Industries including the Exhibited Animals Advisory Committee and NSW Office of Water ▪ Commonwealth Department of the Environment ▪ NSW Environment Protection Authority ▪ WorkCover NSW ▪ NSW Health ▪ Office of Environment and Heritage ▪ Featherdale Wildlife Park ▪ Taronga Zoo ▪ Transport for NSW ▪ Roads and Maritime Services; and ▪ Any other public transport service providers including Busways. The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to those issues. Where amendments have not been made to address an issue, a short explanation should be provided.	Section 4.0	Provided post-exhibition of the EIS as part of the Response to Submissions report
Further consultation after 2 years	**Report / EIS**	**Technical Study**
If you do not lodge an EIS for the development within 2 years of the issue date of these SEARs, you must consult with the Secretary in relation to the requirements for lodgement	Noted.	
References	**Report / EIS**	**Technical Study**
The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this development.	Noted.	

2.0 Site Analysis

2.1 Site Location and Context

The site is located approximately 33 kilometres west of the Sydney Central Business District (CBD), and approximately 15 kilometres east of Penrith. It falls within the Western Sydney Parklands, and is in close proximity to the Great Western Highway, M4 Western Motorway and Westlink M7, providing excellent access to both the state and regional road network and surrounding parkland areas.

The site of the proposed Sydney Zoo is 16.5ha in size, and irregular in shape, access will be from the Great Western Highway approximately 75m from its southern border.

The site's locational context is shown at **Figure 1**.

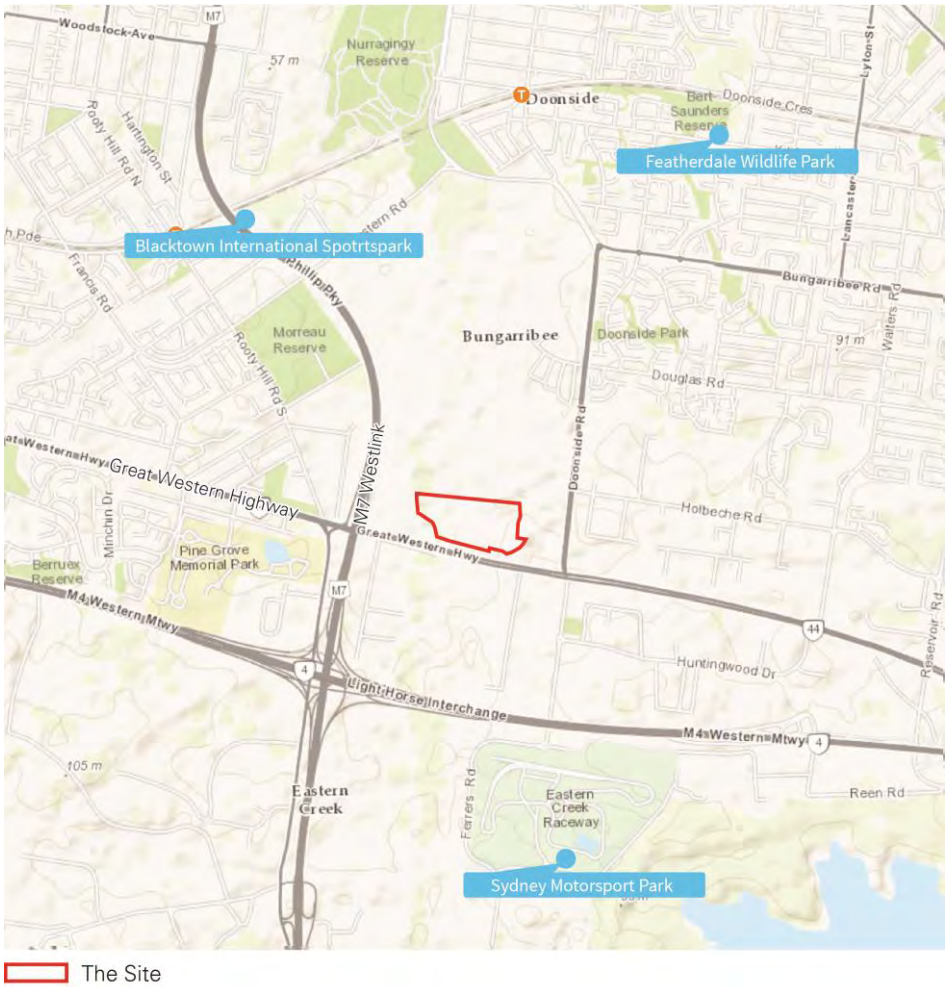


Figure 1 – The subject site (shown in red) is adjacent to the Great Western Highway
Source: NearMap

2.2 Land Ownership and Legal Description

The site is part of the lot legally described as Proposed Lot 11 in Lot 101 on DP1195067 (subject to subdivision as part of this SSD application), and is owned by the WSPT. WSPT is a semi-autonomous statutory authority of the NSW

Government, established and maintained under the *Western Sydney Parklands Act 2006*.

2.3 Site Description

The proposed Zoo's site area is 16.5 hectares. It is irregular in shape. An aerial photo of the site is shown at **Figure 2**.

Figure 2 – The site is situated within the Western Sydney Parklands
Source: NearMap

The proposed Zoo will cover an area of approximately 16.5ha. It is irregular in shape, and has frontage to the Great Western Highway. Access is currently provided by a restricted access gate along its southern frontage to the highway, and by an entry gate off Doonside Road.

Currently the subject site is generally cleared of vegetation. There are two key vegetation communities present on the site, being Cumberland Plain Woodland and River Flat Eucalypt Forest (Eco Logical 2015). These are generally scattered regrowth across the site, with three main stands and three smaller stands within the boundaries of the site. The remainder of the site contains exotic grasslands with some noxious weeds present in areas.

Towards the centre of the site the land rises to a small ridge which runs north-south through the eastern third of the site, and slopes down towards the east,

north, south and west. In particular, the land slopes to the west towards the Eastern Creek which forms the western boundary of the site.

Being part of the larger Bungarribee precinct of the Western Sydney Parklands, there is little in the way of immediate proximate residential housing – the closest being the Bunya residential development approximately 800m to the North (within the suburb of Bungarribee).

Access to the site is afforded off the Great Western Highway just to the south of the southern boundary, which is classified as a State Road (HW5) which runs in an east-west direction. At the existing entry to the site, it is a six lane dual carriageway, with this decreasing to two lanes each way when moving east and west of the site. A speed limit of 80km/h applies at this location. To the east of the site is the Western Sydney Parklands, then Doonside Road, a Regional Road with a four lane dual carriageway. Aligned in a north-south configuration, Doonside Road has a 70km/h speed limit. Doonside Road forms the eastern boundary of the Western Sydney Parklands.

The site is in close proximity to the Great Western Highway and M7 Motorway interchange, approximately 800m to the west. This interchange does not contain any south-facing ramps to the M7 Motorway, with traffic approaching from the south required to utilise the Wallgrove Road off-ramp, approximately 2.5km south of the Great Western Highway. Wallgrove Road is a State Road.

Figure 3 – Looking north across the site towards the Bungarribee residential area
Source: Aspect

Figure 4 – Looking south across the site towards the Bungarribee Industrial Estate
Source: Aspect

Figure 5 – Looking west across the site towards Eastern Creek
Source: Aspect

2.4 Bungarribee Precinct Parklands

The Western Sydney Parklands are a metropolitan level green space which stretches from the North West Growth Centre near Blacktown in the north to the South West Growth Centre near Leppington in the south, and covers an area of 5,280 hectares. The Parklands, upon completion of future long-term development, will become the largest urban parkland in Australia. Currently 40% of its area is interim land uses such as rural residential or vacant land.

The WSPT manages the Western Sydney Parklands, and has identified the Bungarribee Precinct as a key component of the area. The Bungarribee Precinct is approximately 216 hectares in size, with a wide open scenic landscape including Eastern Creek.

The Parklands Plan of Management 2020, which was adopted in 2011 for the Western Sydney Parklands, identifies that the Bungarribee Precinct has capacity to be significantly improved to become an important recreational and tourism hub, providing additional regional recreation, tourism, social and cultural opportunities for Western Sydney.

In 2013 the WSPT carried out stakeholder and community consultation to help shape the development of a Master Plan for the Bungarribee Precinct. Further investigations and studies were carried out during 2014 to assess the feasibility of the Master Plan, prior to its finalisation. The Master Plan for the Bungarribee Super Park was released in early 2015, and is shown in **Figure 6**.

It is expected that over the next five years $15 million will be invested into Bungarribee as the Master Plan is delivered. Detailed Landscape Plans are currently underway to deliver the first stage of works, including a walking and cycling loop track followed by construction of safe access into the park off Doonside Road at Holbeche Road along with landscaping and tree planting. No applications have yet been made for subsequent stages of the Bungarribee Super Park. The targeted date for completion of the Super Park is 2018.

The site of the proposed Zoo is located in the southern part of the Bungarribee Super Park Master Plan, to the west of the access from the Great Western Highway, labelled as Tourism & Business Hub in **Figure 6**. Note that the area to the eastern side of the access road is not part of the Sydney Zoo development area.

Bungarribee Master Plan

Figure 6 – Bungarribee Super Park Master Plan identifies the tourism hub site
Source: Western Sydney Parklands Trust

2.5 Surrounding Development

The Bungarribee Super Park surrounds the site on all sides. To the north of the site, beyond the Bungarribee Super Park, is the residential suburb of Bungarribee, approximately 800m away, with separation via Bungarribee Creek which meanders through the parklands.

The Arndell Park industrial estate is to the east of the Bungarribee Super Park. This contains a large number of industrial businesses, and warehousing type buildings.

To the south, across the Great Western Highway, sits additional industrial development in Huntingwood, again with a mixture of industrial and warehouse type businesses. The M4 Motorway is approximately one kilometre south of the site, beyond which lies the Eastern Creek race track.

Beyond Eastern Creek and the western part of the Bungarribee Super Park, the Westlink M7 Motorway is to the west, and provides a strong border to the Parklands.

2.5.1 Nearby Tourism and Recreational Attractions

There are a number of nearby tourist and recreational attractions to the proposed Zoo (**Figure 7** and **Appendix W**). A brief summary of select major active recreational facilities is provided below.

Wildlife Attractions

Featherdale Wildlife Park

Featherdale Wildlife Park (Featherdale) is located in Doonside, near Blacktown. Approximately 3km to the north of the proposed Zoo in a highly urbanised area, Featherdale provides an Australiana experience with an emphasis on birdlife. It generally caters to international tourists by offering interactive experiences with Australian native wildlife. The park is currently owned by Elanor Investors Group, an investment and funds management business.

Calmsley Hill City Farm

A farm focused attraction Calmsley Hill City Farm is situated 8.7km south of the Zoo site, and contains a number of native and farmyard species for tourists to experience. The farm also offers daily shows and opportunities for on-site camping and conferences. Situated within the southern part of the Western Sydney Parklands, the farm is currently operated under a lease agreement with the WSPT, similar to the proposed operational arrangement of the Sydney Zoo.

Taronga Zoo

Taronga Zoo is located on the northern shore of Sydney Harbour in Mosman, about 3km north-east of the Sydney CBD and 35km east of the Sydney Zoo site. Covering 21ha, the Taronga Zoo contains over 4,000 animals with approximately 340 species. Other facilities include a shop, café and restaurants and information centre. Taronga Zoo also offers daily shows and educational programs for schools, and provides veterinarian services for injured wildlife. Sydney Zoo hopes to complement Taronga Zoo by increasing the opportunities for people in Western Sydney to learn about animal conservation.

Wild Life Sydney Zoo

Situated on Darling Harbour adjacent to the Sydney CBD, Wild Life Sydney Zoo is next to the Sydney Aquarium and provides an almost fully internal wildlife park experience. Wild Life Sydney Zoo focuses on native Australian species, spread across 10 different zones. The Wild Life Sydney Zoo is not associated with the proposed Sydney Zoo as part of this SSD.

Australian Walk About Wildlife Park
Located near Gosford, approximately 50km north-east of the Sydney Zoo. Walk About provides animal experiences for tourists of approximately 180 species of mammals, birds, reptiles and frogs, across a feral free area of 80 acres, with a total site area of 170 acres. Designed with a free-roaming component, the Park focuses on Australian native species. The Park site also contains a number of Aboriginal cultural significant sites.

Koala Park Sanctuary
The Koala Park Sanctuary is located approximately 17km north-east of the proposed Zoo, in West Pennant Hills. Situated in a highly urbanised area, the Koala Park provides a natural habitat for a range of Australian native animals and birds, while providing a personal koala feeding experience. The Park also contains a Koala Research Hospital and tends to focus more on conservation of koalas than acting as a tourist attraction.

Symbio Wildlife Park
Symbio is located south of Sydney in Helensburgh, approximately 47km south-east of the Sydney Zoo site. Containing a variety of native Australian and exotic species, Symbio is introducing a farm yard animal experience in late 2016, to complement its educational programs.

Major Recreational Facilities

Wet'n'Wild Sydney
Wet'n'Wild Sydney (WWS) is a water park located within the Western Sydney Parklands at Prospect, approximately 4.4km east of the proposed Sydney Zoo. WWS operates during the summer period usually from September to April on select days, and is open seven days a week during December and January. The water park provides a variety of water slides and pool attractions, which generally cater for all ages (subject to height and weight restrictions).

Sydney Motorsport Park
Sydney Motorsport Park (also known colloquially as Eastern Creek International Raceway) is a motorsport circuit located in Eastern Creek, also within the Western Sydney Parklands, approximately 1.9km directly south of the Zoo site. This venue hosts a multitude of racing events throughout the calendar year, including a round of the V8 Supercars Championship, around either a 4.5km or 3.9km circular race track. A drag racing strip, go-kart track and tourist stunt driver experience are also located on the site.

Blacktown International Sportspark
A multi-sports venue located in Rooty Hill to the north of the Bungarribee Precinct of the Western Sydney Parklands, the Sportspark contains sporting fields for cricket, Australian rules football, athletics, baseball, soccer and softball, as well as including administration centres and park land. The Sportspark hosts approximately 3,700 events a year, with half a million visitors annually.

Cables Wake Park
Cables Wake Park is situated near the Nepean River in Penrith, 17.5km west of the subject site. The park contains two lakes, which contain cable skiing infrastructure to allow for water skiing. Furthermore the park includes a playground area, jumping pillow and picnic facilities. The park is open all year round.

Sydney International Regatta Centre
The Regatta Centre was built for the 2000 Sydney Olympics in Penrith Lakes, north of Penrith. It contains rowing and sprint kayak courses, with additional sporting facilities including a cycle path. The Regatta Centre is open to the public on non-event days, offering picnic facilities and the use of the lake.

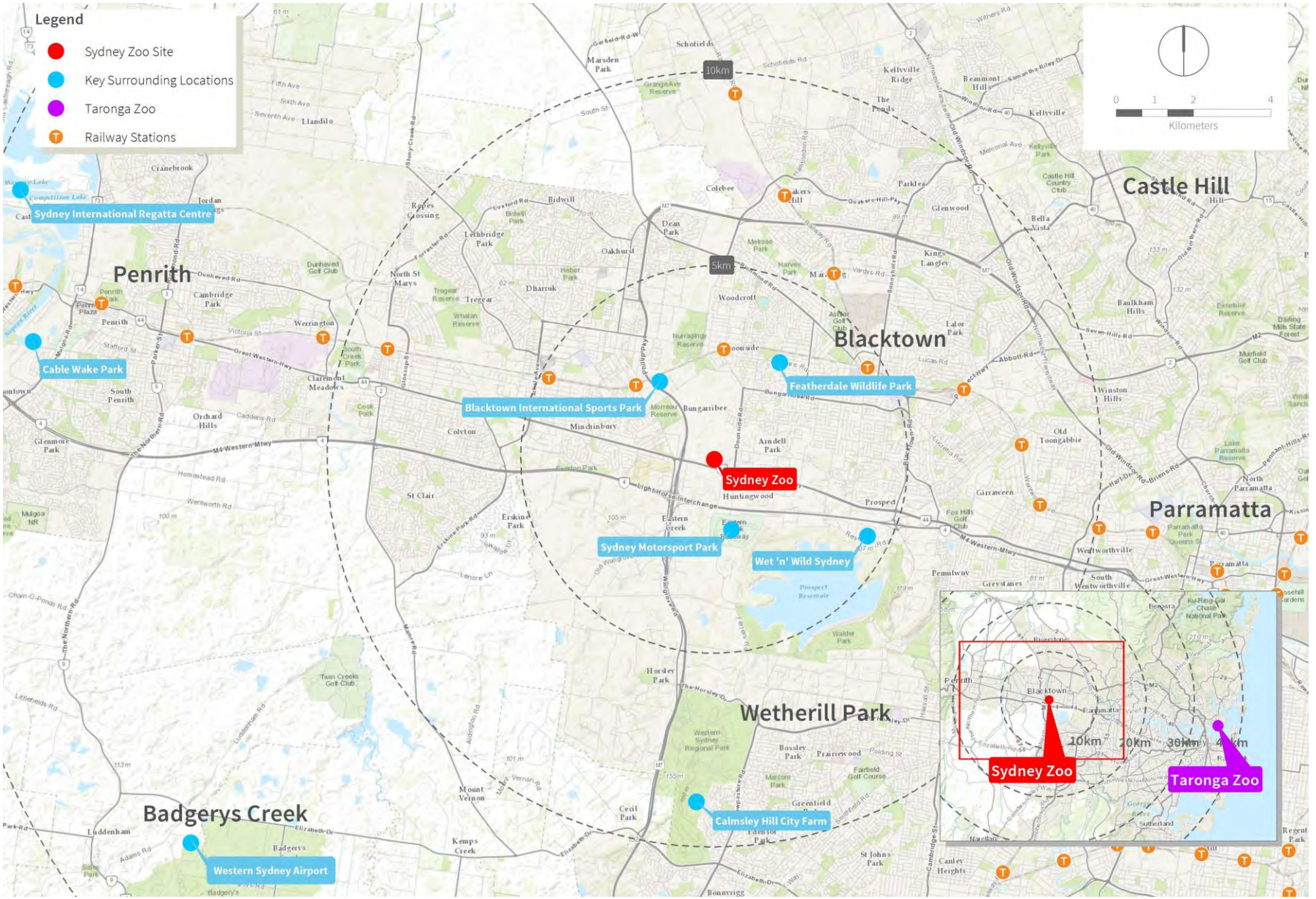


Figure 7 – Surrounding major tourism and recreational facilities
Source: JBA

3.0 Description of the Project

This chapter of the report provides a detailed description of the proposed development. Landscape and architectural drawings are included at **Appendix B** and **Appendix C** respectively.

This application seeks approval for the following development of Sydney Zoo:

- Animal exhibits across several enclosures of varying design for a range of native and exotic animals;
- Back-of-house buildings for exhibits;
- Main entrance building comprising entry/exit, and gift shop;
- Restaurant and café;
- Kiosks and amenities;
- Show arena;
- Picnic areas and gardens;
- Wetlands and waterways;
- Service building containing:
  - Administration areas;
  - Curatorial and food preparation areas; and
  - Veterinarian space.
- Signage;
- Service yard with maintenance shelter;
- Internal services and utilities to support the Zoo, including water, sewer, electricity and telecommunications;
- Main car park for approximately 475 vehicles, with an overflow car park for approximately 840 vehicles (accessed via an internal road connecting to the Great Western Highway);
- Bus and coach parking;
- Subdivision; and
- Landscaping of the site associated with all of the above.

The masterplan for the Zoo is shown at **Figure 8**.

Figure 8 – The proposed masterplan for the Sydney Zoo
Source: Aspect

This SSD application does not seek approval for the specific details of each exhibit space as these vary depending on the species within each. Each exhibit space will be in compliance with the relevant requirements under the *Exhibited Animals Protection Act 1986* (EAP Act) and will be subject to individual inspection and certification post-construction in order for Sydney Zoo to receive a licence to operate as an exhibited animals facility. The SSD application does include the main structural elements of each exhibit including its size and shape and the bulk earthworks (such as moating and mounding). Refer to **Section 5.1.3** for further details about the EAP Act.

3.1 Project Design Principles

The Zoo masterplan has been developed using the following design principles:

- Prioritisation of animal welfare: animals will be exhibited in large enclosures with animal welfare and care at the centre of the Zoo's operating ethos and design;
- Creation of an immersive experience: spaces will be designed to provide people with intimate experiences with animals;
- Natural habitat animal grouping: the Zoo will be divided into habitat zones to mimic animal habitat and plant communities;
- Creation of tropical centre and transition to open grasslands: the design of the Zoo is to work with its natural bushland setting by grouping exotic species at the centre of the site and merging to native grasslands at the outskirts;
- Provide opportunities to relax: incorporating picnic areas, play zones and a restaurant; and
- Maximise water reuse and enhance biodiversity: the Zoo will provide engineering solutions to maximise the reuse of water on-site through water saving and recycling strategies. New areas of native and exotic planting will enhance existing vegetation communities.

3.2 Numerical Overview

The proposed Zoo requires a number of buildings to be developed to provide for general services and utility provision. These are identified below in **Table 3**, with further detail provided in **Section 3.4** and the architectural plans at **Appendix C**.

Table 3 – Key development information

Component			Proposal
Site area			16.5ha
GFA by building	Building 1	Entry/Retail	919.6 m^2
	Building 2	Restaurant (Boma)	928.8 m^2
	Building 3	Administration/Curatorial/Vet	1130.1 m^2
	Building 4	Nocturnal Habitat	350.2 m^2
	Building 5	Insect Habitat	350.2 m^2
	Building 6	Aquatic Habitat	343.0 m^2
	Building 21	Eastern Amenity Block	34.1 m^2
	Building 22	Western Amenity Block	34.1 m^2
	Building 23	East Kiosk	34.1 m^2
	Building 24	West Kiosk	34.1 m^2
Maximum building height	Building 1	Entry/Retail	7.60 m (excluding screen cladding)
	Building 2	Restaurant (Boma)	6.00 m (excluding cladding)
	Building 3	Administration/Curatorial/Vet	4.37 m (building height from ridge to

Component			Proposal
			ground)
	Building 4	Nocturnal Habitat	5.00 m (excluding landscaping)
	Building 5	Insect Habitat	5.00 m (excluding landscaping)
	Building 6	Aquatic Habitat	5.00 m (excluding landscaping)
	Building 21	Eastern Amenity Block	2.10 m (excluding sloped roof)
	Building 22	Western Amenity Block	2.10 m (excluding sloped roof)
	Building 23	East Kiosk	2.10 m (excluding sloped roof)
	Building 24	West Kiosk	2.10 m (excluding sloped roof)
Car parking		Main car park	475 spaces (plus 9 disabled spaces)
		Overflow car park	840 spaces
		Coach parking	5 coaches or 8 minibuses, 6 dedicated minibus spaces

Back-of-house buildings for exhibits have not been included in the above **Table 3** as these are described in more detail in **Table 4**. They will generally be of similar built form and structure, with variations for animal species as required, for instance shelter height specific to a giraffe and heavy duty construction materials for elephants and hippopotamus. This SSD application seeks approval for general structural, locational and space components of each of these buildings as outlined in **Appendix C** and in **Table 4** (see **Section 3.4.6**).

3.3 Site Preparation / Bulk Earthworks

There will be some site preparation works required prior to construction of the Zoo. These will include bulk earthworks to provide minor regrading of the site for development purposes, along with exhibit wall mounds and moats. All soil excavated on-site will be reused on-site, to avoid the need for off-site removal of soil.

The earthworks will not fundamentally change the topography of the site but are intended to fine-tune levels to support the landscape outcomes. Approximately 13,600m^3 of clean fill will be brought to the site to support landscaping. Fill will be virgin excavated natural material (VENM) or excavated natural material (ENM) that complies with the Environmental Protection Agency's (EPA) ENM Order 2014 and ENM Exemption 2014, issued under the Protection of the Environment Operations (Waste) Regulation 2014. It is likely that fill contents will be obtained from tunnelled infrastructure projects in North West Sydney.

3.4 Built Form

The following buildings are proposed to provide services to the Zoo. Detail on the design of these buildings is provided in **Appendix C**. The built form of the below structures has been designed in conjunction with the wider landscaping of the Zoo to create a single interwoven environment. The built form of buildings has been designed based on a number of key principles:

- reduce the impact on natural environment and biodiversity;
- reduce the use of finite resources in accordance with achieving a sustainable eco-footprint;
- resources must be used more effectively and efficiently in material, product, component and assembly production, and during construction i.e., improve output per unit input;
- reduce the energy and water inputs to reduce embodied energy and water;
- reduce the waste generated during the material life cycle flows;
- select durable, long lasting materials;

- select materials and components with low maintenance and cleaning requirements;
- use efficient and flexible space configurations;
- opt for local materials and product to reduce transport energy impacts;
- promote renewable, reusable, recycled and recyclable material content; and
- select materials, products components and assemblies that enhance human health and contribute to a healthy indoor air quality e.g. low volatile organic compound (VOC) emissions, toxicity and flammability in the event of fire.

3.4.1 Entry/Retail Building

Land Use & Function

The primary concept is to have the buildings mimic the landscape and blend into the existing and proposed new landscape solution for the site. The entry building will be the most publically visible structure on the subject site, and will act as a gateway to the Zoo. It is proposed to house entry and pay zones with a number of entry gates, group check-in areas, bathroom facilities for both guests and staff, a first aid room, a retail store through which guests will exit the Zoo, and a general dwell zone inside the entry. A number of small offices will also be located within the entry building for administration purposes.

Building Height

The building itself will be a single storey with a height of 7.6m to the peak of the roof, however architectural screening elements will give an aesthetic of between approximately 9.5m and 10.5m.

Materials and Finishes

The proposed entry building has been designed to offer the appearance of a traditional African structure through the use of slatting. The wall and roof structure will be constructed from cross laminated timber (CLT) panels, with the roof structure further lined with colorbond panelling. External walls will be lined with ply cladding. Glass will be used for windows and doors where necessary, with a timber façade finish across the remainder of the building.

Figure 9 – The proposed entry and retail building
Source: Misho + Associates

3.4.2 Restaurant (Boma)

Land Use & Function

Boma is the word for an African enclosure usually made of thorn buses, tree limbs and latterly of steel fencing for the protection of tribal people and their animals from carnivorous animals at night. This concept has informed the design of the restaurant, and will serve a range of meals in various formats (buffet, pre-packed and hot food). It will seat approximately 800 people at a range of table and seating types, at an average area per person of 1.2m^2, for a total dining space of 960m^2. A kitchen and food presentation area of 240m^2 will be included, resulting in a total floor area of 1,275m^2. The Boma will be the key focal point of the built form structures within the Zoo grounds.

Building Height

The Boma is proposed to be one storey with a height of 5.25m however architectural features will provide an aesthetic height of between 6m and 6.5m.

Materials and Finishes

As with the entry building the proposed Boma has been designed to present as a traditional African hut. The wall and roof structure will be constructed from CLT panels with a steel frame, with the roof structure further lined with colorbond panelling, including heavy insulation. External walls will be a combination of glass windows, louvres and solid panels with recycled timber cladding. External vertical walls will be painted compressed fibre cement sheeting, with recycled timber cladding.

Figure 10 – The Boma (restaurant) within the Zoo grounds looking north-west through the Zoo
Source: Misho + Associates

3.4.3 Administration/Curatorial/Veterinary Building

Land Use & Function

Located in the south-western corner of the site, the main administration building seeks to provide a simple low scale building which blends into the surrounding landscape while providing a sustainable work environment for staff. This 1.156

square metre building contains a number of office areas with workstations, private offices and meeting rooms, and also staff break-out rooms and outdoor areas. Additionally, this building extends into incorporating the animal food preparation and veterinary facilities. There will be parking spaces for at least four medium sized delivery trucks, for animal movement and food deliveries. This area will not be visited by members of the general public, and will be reserved for use by staff and deliveries only.

Building Height

The staff building will be single storey in height, to ensure it is imperceptible behind landscape features and exhibits in close proximity. This building is also stepped to respond to the natural slope of the landscape in this location. The maximum height above the finished ground level will be approximately 4.37 m.

Figure 11 – The proposed administration, curatorial and veterinarian building
Source: Misho + Associates

Materials and Finishes

To ensure consistency in design, the staff building will be of similar external finish to that of the Boma and entry building, with CLT panels and colorbond roofing. Internal walls will be exposed CLT panels with a clear finish.

3.4.4 Exhibit Buildings

Land Use & Function

There are several exhibit buildings which form part of the proposal, with key ones including the nocturnal habitat, insect habitat and aquatic habitat buildings. These will include species exhibit spaces of varying size inside a controlled environment. They have been designed to have a building envelope that does not impact on the landscape, and blends into the surrounding environment. This will be achieved through burying pre-fabricated concrete structures into the landscape, resulting in only the entry and exit ways being visible as a component of the building.

Figure 12 – The proposed reptile and insect habitat buildings
Source: Misho + Associates

Figure 13 – The proposed reptile and insect habitat buildings will be merged into the landscape
Source: Misho + Associates

Building Height

The exhibit buildings will be five metres in height, with additional height added by landscape features. These landscape features will however assist in the building blending in to the surrounding environment, which will reduce the visible or apparent height of the building.

Materials and Finishes

These buildings will be constructed from pre-fabricated concrete panels, and covered by earth, with screening through landscaping features including vegetation. External end walls of the buildings will be lined with colorbond panels, with a combination of glass windows, louvres and solid panels with recycled timber cladding.

3.4.5 Show Arena

Land Use, Function and Materials

The show arena will be used to provide educational presentations and animal shows to visitors. It will be designed as an amphitheatre, with terraced informal seating to allow for a suitable viewing experience. The show arena will include dedicated ambulant spaces. Access will be provided via a number of aisles and stairs. Vegetation will be planted to provide shading.

3.4.6 Back of Exhibit and Works Depot Buildings

Land Use & Function

There are a range of back-of-exhibit buildings that will serve a variety of purposes for the associated exhibits. These include quiet areas for animals to rest, food preparation and minor veterinarian attention (including animal washing) and keeper access.

Table 4 – Back-of-house building breakdown

Building Reference	Building Purpose	Building Height	Building Area
Building 7	Back of house: Dingo habitat	2.40 m	24.8 m^2
Building 8	Back of house: Australian habitat walk, Gorilla and Arboreal Monkey	5.622 m	509.6 m^2
Building 9	Back of house: Farm Experience	3.907 m	63.9 m^2
Building 10	Back of house: Chimpanzee, Baboon and Orangutan	5.122 m	589.7 m^2
Building 11	Back of house: Tiger	4.068 m	114.6 m^2
Building 12	Back of house: Sun Bear	4.068 m	98.8 m^2
Building 13	Back of house: Elephant	8.366 m	279.0 m^2
Building 14	Back of house: Lions and Cheetah	4.764 m	443.9 m^2
Building 15	Back of house: African Wild Dog	2.40 m (sloped roof)	66.8 m^2
Building 16	Back of house: Hippopotamus, Puma and Bison	4.068 m	308.5 m^2
Building 17	Back of house: Giraffes and Zebra	8.557 m (at highest point)	102.2 m^2
Building 18	Back of house: Weather Shelters	4.017 m	97.8 m^2
Building 19	Back of house: Rhinoceros	2.70 m (to base of roof)	105.5 m^2
Building 20	Works Depot	4.172 m	95.8 m^2

These buildings will be species specific for that exhibit space. For example, the back-of-exhibit building for the giraffe enclosure will require higher than standard entry doors for animal access (refer to **Appendix C** for indicative specifications).

The works depot, located in the north-eastern corner of the Zoo site will contain a service yard for Zoo vehicles (trucks and light vehicles) and six sheds for the storage of equipment and materials.

Additionally, composting will occur in this location with approximately 369 tonnes of organic waste a year being composting (refer to **Appendix Q**).

Building Height

Back-of-exhibit buildings will generally be one storey in nature, and designed so as to be screened by landscaping and features of the exhibit.

The works depot will also be one storey in nature.

Materials and Finishes

Landscaping such as bamboo, timber and vegetation planting, and exhibit features, including animal enrichment equipment, will be used to screen the back-of-exhibit buildings, which will generally be constructed from colorbond steel sheeting. The works depot will be constructed of colorbond steel also.

3.4.7 Other Buildings

Other buildings proposed within the Zoo grounds include two kiosks and restroom facilities (as described in **Table 3** and **Appendix C**). These are designed to be of a similar style to those of the larger Boma and entry buildings.

3.5 Landscaping Elements

3.5.1 Vegetation

The underlying concept of the Zoo is to create distinct vegetated communities which form the base of the varying habitat areas which make up the animal grouping categories. This has resulted in three distinct vegetation zones being defined:

- South East Asian Tropical;
- African Grasslands; and
- Cumberland Plain Woodland.

The main Zoo entrance will be planted with a variety of tropical trees and understorey plants, focusing on species that will provide shade and screening. The Australian Habitat in the east of the Zoo site will contain both endemic tree and understorey species, including native bush food and bird attracting plants. This planting will complement the educational and Aboriginal interpretive programs to be run. A range of eucalypts will be planted and harvested for koala feeding, reducing the need to bring food in from off-site. The western part of the site will contain a design of African Grasslands planting, including exotic tree species mixed with native and exotic grasses.

Native trees will be planted within the proposed car park to provide shading for vehicles, while also ensuring a contiguous connection to the wider Parklands. Native understorey planting will also be provided.

3.5.2 Lighting

Lighting for the Zoo will be provided via way of in-exhibit Smart Pole flood lights, pathway lighting bollards and in ground landing lights with 5m spacing, and 15m centres within the car parking area. Underside rail lighting will also be provided along parts of the internal walkway, with the elevated boardwalk being provided with rail lighting also.

Lighting Categories

The proposed lighting categories and levels of illumination for the Zoo are as follows:

- Primary car park: Category P11b
  - Accessible car spaces: Category P12
  - Staff car park: Category P11c
- Primary circulation pathways and elevated boardwalk: Category P4 (low level directional bollards)

- Australian animals circulation pathway: Category P5 (low level directional bollards or ground mounted fittings)
- Service road: Category P5 (glare control light fittings)

Details of specific lighting fixtures will be determined during the detail design stage of the project.

3.5.3 Signage

The proposed signage, for which consent is sought as part of this DA, is described in the Signage Strategy at **Appendix Y**. Specifically the signage component of this application is:

- Entry/retail building signage
  - Simple text signage approximately 75cm in height
- Wayfinding signage inside the Zoo's secured area

Details of the Gateway Sign at the entrance to the site, and signage at the Great Western Highway intersection are still being finalised, in consultation with the WSPT. These external signs will the subject of a separate application.

3.6 Access and Accessibility

3.6.1 Accessibility

The Premises Standards 2010 set performance requirements and provides references to technical specifications to ensure dignified access to, and use of, buildings for people with a disability. They clarify the general non-discrimination provisions of the *Disability Discrimination Act 1992* (DD Act) in relation to the design construction and management of buildings. The requirements of the Premises Standards 2010 mirror the requirements of Building Code of Australia compliance, and under that Code the buildings are required to be accessible to and within all areas normally used by occupants.

Access has been considered with regard to providing clear ways of reaching internal destinations and moving easily through the wider precinct. The pedestrian pathway has been designed to be one-directional with a minimum width of four metres, and includes a 180m long elevated boardwalk across the African Grasslands exhibit space. Re-grading of the site during the bulk earthworks phase will ensure a maximum slope of 1:40 is achieved across all walkways.

A review of the proposed plans has been undertaken by BCA Logic (**Appendix X**) which confirms that the design of the buildings within the Zoo can comply with the requirements, subject to detailed design.

3.6.2 Pedestrian Access

Pedestrian access to and from the Zoo will be limited given the location of the site on a major highway. In the short term pedestrian access will be available only via the new internal access road from the Great Western Highway. If WSPT construct a connecting internal access road from the Great Western Highway to Doonside Road in the future, then that would provide for further pedestrian access to the Zoo.

Internal pedestrian access has been considered in regards to providing clear ways of moving through the Zoo site. The main pathway has been designed to be one-directional, with sufficient width and identification markers. Access will be provided along at-grade pathways and a 180m long elevated walkway. These will

be compliant with the relevant Australian Standards for pedestrian and wheelchair access, with the elevated walkway accessible from a 1:14 ramp.

3.7 Vehicular Access and Parking

Vehicular access to the site will be via an access road from the Great Western Highway to the south. This access road will extend along the eastern boundary of the Zoo site, up to the entrance to the Bungarribee Super Park off Doonside Road. The Zoo will have its own entry drive off this access road via a roundabout. The access road and roundabout are to be constructed separately by the WSPT.

Parking is proposed to be provided in two main areas of car parking. The main car park will have capacity for 475 vehicles, including 5 coach layovers (or up to 8 minibuses), with a further 6 angled minibus parking bays in the south-eastern corner of the car park. Nine accessible parking spaces will also be provided in addition to the 475 formal spaces. This will be a hardstand car parking area with kerb and guttering drainage. The secondary, or overflow, car park will have provision for 840 vehicles with a permeable gravel surface. It is designed to accommodate occasional peak visitation days and will be used infrequently. No formal kerb and guttering will be provided in the overflow car park.

It is proposed to provide unrestricted car parking during the Zoo's initial opening period to determine the suitability of that system. Any evidence that indicates the proposed unrestricted parking within the Zoo grounds is creating parking issues for adjacent properties will result in further assessment being undertaken. Future parking measures to reduce any future impacts may involve the need for off-peak ticketing price reductions.

3.8 Environmentally Sustainable Development

The Zoo's environmentally sustainable development (ESD) initiatives include the use of materials selection that reflect the key aspects of ESD. There are three main forms of materials proposed to be used for the built forms described in **Section 3.4** above:

- Cross laminated timber;
- Pre-fabricated concrete panels; and
- Recycled timber by-product.

3.8.1 Cross Laminated Timber

CLT is a green building technology using the world's most sustainable building material of wood, which has zero embodied carbon. Wastage of material is eliminated through factory manufacturing to precise pre-cut measurements. Furthermore, the air-tight nature of CLT allows buildings to be more efficient for heating, reducing energy demand. CLT panels can be recycled at the end of a buildings life, for use as new materials.

3.8.2 Pre-fabricated Concrete Panels

While there is a high level of embodied energy within concrete panels, the use of this material can be justified as it contributes to lower operational energy requirements over the life of the building. For example, large amounts of thermal mass can significantly reduce cooling and heating needs, particularly relevant for the Zoo's location in Western Sydney which can experience fluctuating weather patterns. This is important as the three habitat buildings which will be constructed from this material, require stable internal environments. The strength of the concrete panels also allows for the roof and sides to become 'green roofs' through

the use of earth mounds and vegetation. This feature will assist in the proposed habitat buildings 'blending in' with the surrounding landscaping. Furthermore, pre-fabricated concrete can be installed quickly, reducing the time a heavy vehicle or crane is required on-site.

3.8.3 Recycled Timber

Recycled materials, particularly timber, will be used across the site for external cladding of buildings and structure frames.

3.9 Infrastructure and Services

Servicing the Zoo site will be relatively simple given the sufficient sewerage, water and electricity networks within the area. These connections and any utility realignment will be completed by the WSPT.

3.9.1 Building Services

To reduce electricity consumption across the Zoo, a number of the buildings will be reliant on natural ventilation and ceiling fans.

Air-conditioning units (include packaged air conditioners (PAC) units and variable refrigerant control (VRF) units will be used for certain areas of the main buildings:

- Entry/Retail Building – VRF units will be used for the security room, office space and retail area. Exhaust fans will be installed in the bathroom facilities;
- Boma/Restaurant – PAC units will be used in the main dining area and a VRF unit in the office area. Exhaust fans will be installed for the kitchen and bathroom facilities; and
- Administration/Curatorial – VRF units for the office space, break-out areas and veterinary rooms. Exhaust fans will be installed for the veterinary waste room.

3.9.2 Sewerage Network

There is an existing adjacent trunk sewer running through the western part of the Sydney Zoo site to which Sydney Zoo will be granted a right of easement for access.

The adjacent existing trunk sewer (to the west of the proposed Zoo site) is a DN375 (375mm diameter) and caries in depth from 1.5m to 7.5m below ground level. Connection points have been provided at every manhole along this trunk main which the proposed Zoo can connect into. It should be noted that the existing trunk sewer has been built with 15m to 18m high vent stacks at approximately 400m intervals.

The sewer was designed with a capacity to cater for overall equivalent persons (EP) capacity of 3,500 from the Bungarribee precinct. This EP was calculated as follows:

1. Local Commercial Space: 4.4ha at 75EP/ha = 330 EP
2. Open Space: 77ha at10EP/ha = 770EP
3. Amphitheatre: 50,000 persons at 0.048 = 2,400EP

The applicable Sydney Water Water Services Association Code dictates that the EP for the expected patronage of the Zoo (8,000 persons) is 400EP. This was calculated by categorising the Zoo as a 'General Public Entertainment Facility'.

This calculation of 400EP falls well within the overall 3,500 EP that has been allowed for the entire Bungarribee precinct.

Animal waste will not generally be managed via the sewage system, with faeces collected for on-site composting or off-site disposal. Back of house areas will be washed down daily and this wash down water will be directed to sewer.

3.9.3 Water

Existing water mains adjacent to the proposed Zoo site along the Great Western Highway include a DN500 (500mm diameter) on the northern side of the roadway and DN375 and DN600 mains on the southern side.

The proposed Zoo is able to connect to one of these three mains, with the WSPT responsible for the provision of these services to the Sydney Zoo boundary. The WSPT prefers for this connection to occur along the eastern boundary of the Zoo site, with the required easement parallel to the Parkland Access Road.

3.9.4 Electricity

The nearest zone substation to the Zoo site is the New Huntingwood electrical zone substation. It is expected this substation will be utilised to service the Zoo.

Major existing electrical services currently located near to the proposed Zoo site are:

- 11kV on the southern side of the Great Western Highway;
- 11kV along Doonside Rd; and
- overhead 132kV running down Doonside Road.

WSPT is responsible for the provision of these services to the Sydney Zoo boundary.

3.10 Subdivision

It is proposed to subdivide the current Lot 101 on DP1195067 to create two new lots as shown in the Proposed Plan of Subdivision (included at **Appendix Z**). Proposed Lot 11 has an area of 16.505ha and contains the proposed Zoo footprint and follows the agreed lease area between Sydney Zoo and the WSPT. Proposed Lot 10 (with a total area of 188.9ha) contains the remainder of the current Lot 101 on DP1195067. Both Proposed Lot 11 and Proposed Lot 10 will remain under the ownership of the WSPT.

As the proposed Zoo site (proposed Lot 11 in Lot 101 on DP1195067) is set back from the Great Western Highway, access will be provided through a Right of Access and Easement for Services (identified as 'E' on the Proposed Plan of Subdivision at **Appendix Z**). This will be 36 wide, 20 wide and variable, to provide flexibility for the future construction of the Parkland Access Road by the WSPT.

The proposed subdivision is considered necessary to allow for the Zoo to operate effectively, with a defined legal lot boundary and for the registration of the land lease.

3.11 Construction Sequencing

Construction of exhibits may be delivered sequentially to meet operational and cost control requirements.

3.12 Zoo Operations

3.12.1 Operating hours

The Zoo is anticipating operating hours from 9.00am till 6.00pm daily, with later operating hours up to 10.00pm proposed for the peak summer period, with a night zoo experience also under consideration.

Zoo patronage is expected to be variable in nature, with annual visitation of up to 800,000 people expected. Approximately 50% of this visitation is expected during school holiday periods, with a maximum daily attendance of up to 8,000 people per day during the peak summer school holiday period.

These patronage variations have been outlined in three visitation scenarios (**Table 5**):

- Peak period: mid/late December to late January (summer school holiday period) and including public holidays;
- Shoulder period: beginning of November to mid/late December and late January to end of February and including all other school holidays; and
- Off-peak period: beginning of March to end of October (excluding school holidays).

Table 5 – Daily estimated visitation profile

Period	Day	Minimum Daily Visitation	Maximum Daily Visitation
Peak	Weekday	3,400	5,500
	Weekend and public holiday	6,000	8,000
Shoulder	Weekday	1,400	2,300
	Weekend	2,500	3,300
Off Peak	Weekday	900	1,450
	Weekend	1,575	2,100

Source: GTA Consultants

3.12.2 Employment

The Zoo will employ approximately 50 full-time staff, and 50-60 casual staff to accommodate peak visitation periods.

These positions will be in a range of roles including curatorial, animal care, administrative, landscaping, repairs and maintenance, customer service and retail, food service and cleaning. These positions may be available as a mix of full-time, part-time and casual roles. These roles will also include entry-level, flexible positions for young people seeking to join the workforce.

3.12.3 Partnering and Educational Opportunities

The Zoo has opportunity to create partnerships with various educational facilities and organisations, including the University of Western Sydney, University of Sydney, TAFE NSW and Muru Mittigar. It is anticipated any of these would be co-beneficial, with research opportunities for each party involved available. The Zoo would also seek to participate in national and international breeding programs for species identified as endangered.

Additionally, the Zoo intends to offer and promote strong educational programs around the areas of conservation, local natural history and local Aboriginal and European heritage. The Zoo will use exhibits to offer educational experiences

about the Aboriginal heritage of the local area, including Aboriginal history, cultural education, bush food, medicine and technology. The European heritage is almost as rich in the area, with much of what are now industrial estates historically being farmland with significant homesteads. These programs are expected to drive significant demand from school excursions, and the Zoo will develop age appropriate educational materials and activities to facilitate this. It is anticipated that 40,000 school students a year would attend the Zoo, of an estimated 450,000 school students in the area.

3.12.4 Security

The Zoo will be within an enclosed environment. In addition the Zoo proposes to include a full closed-circuit camera system, with night time security patrols. Additionally, animal medication will be locked in a secure room, with animal control firearms also secured in an appropriate firearm safe. NSW Police have been informed of the policy around firearm security.

Any monies collected during the course of operations will be removed on a daily basis by a licensed security firm.

3.12.5 Animal Escape Policy

In the situation of an animal escape occurring, the Zoo has prepared an Animal Escape Policy which outlines the process to be followed, which includes the identification of the species and classification of it as a dangerous specimen. The following species classified as dangerous for the purposes of this policy include:

- Venomous Reptiles;
- Big Cats;
- Primates;
- Ratites, Cassowary, Emu and Ostrich;
- Crocodilians;
- Ungulates; and
- Elephants.

Emergency evacuation drills will be conducted onsite twice a year in conjunction with the required fire safety and evacuation exercises.

3.12.6 Disease Management, Health and Hygiene

Sydney Zoo is in the process of preparing a Workplace Health and Safety Plan which addresses the matter of hygiene and zoonosis, which are diseases that can be transmitted between humans and animals.

The policy will identify practices and procedures to be followed regarding infectious disease prevention, employee health and visitor health. In particular, a list of primate zoonosis prevention measures would be prepared as follows:

- Hands to be washed frequently, especially after handling animals, food, bedding, enclosure material, excrement, tissues and body fluid. Hands must be washed before and after using the toilet, eating and smoking. Hand washing is probably the most effective means of preventing diseases transmission.
- Strict personal hygiene is essential. Apart from hand washing, human food should not be prepared in animal kitchens (and vice versa), no smoking, eating or drinking in animal areas, keeping hands away from mouth, nose and eyes while working around animals and their faeces, and no chewing on pens, pencils or needle caps. Animal utensils, e.g. bowls, knives, should not be used for preparing human food and vice versa.

- Enclosures should be cleaned to minimise the risk of creating aerosols or droplets of potentially infectious material. Wearing protective clothing (masks, gloves, goggles or glasses) and the manual removal of bedding, food and faeces prior to hosing, decreases the risk of creating aerosols or droplets. Scrubbing dirty areas with disinfectants should be done before hosing. The use of high-pressure water hoses and steam cleaners should be kept to a minimum.
- People who are ill (cold, flu, other respiratory infections, cold sores, gastroenteritis) should avoid working with primates during their Illness.
- If people working with primates get sick (fever, chills, diarrhoea, open sores) they should seek medical attention and inform their doctor that they work with primates.
- Appropriate restraint and immobilisation techniques must be used if an animal is to be handled. This is essential in order to prevent trauma to the handler and the animal. Protective clothing such as gloves, overalls and goggles should be worn when handling some primate species, particularly if health status and origin are unknown. If injured, people should wash wounds thoroughly with a disinfectant soap and seek medical attention if indicated.
- Immunocompromised people (e.g. those with AIDS, or other illnesses which suppress immunity, receiving radiation, chemotherapy or steroids), the young and the elderly should be extremely cautious when working with primates.
- After injecting a primate needles must not be recapped, and all sharps must be disposed of in approved containers.
- People with open cuts or sores on their hands should wear gloves.
- An effective pest prevention or control program (insects, rodents, and birds) should be maintained in any primate facility.
- All primate deaths should be thoroughly investigated and necropsies carried out by an experienced veterinarian. Protective clothing (gloves, masks, goggles, overalls, aprons and gumboots) should always be worn. If a zoonotic disease is suspected the necropsy should be carried out in a biohazard safety cabinet. Laboratory personnel handling faeces and body fluids from primates should also wear protective clothing and work in a biohazard safety cabinet.
- All primates must be quarantined appropriately and examined and tested for relevant diseases depending on species and country of origin.
- All primates and their blood, tissues, secretions and excreta should be treated as potential sources of zoonotic pathogens. Animals can remain carriers of some zoonotic pathogens despite being healthy and negative on serological and other tests (e.g. herpes B virus).
- All institutions holding primates should have zoonotic disease education and prevention programs in place for their staff.
- Appropriate barriers must be in place to prevent close contact between public and nonhuman primates e.g. glass, wide moats. Providing all the above precautions are taken limited close contact between low risk animals or species is acceptable. Access to animal holding facilities should be restricted to essential personnel. If other people are given access to these facilities then all the above precautions must be strictly followed.
- Appropriate signage must be placed at the entrance to all primate facilities warning of the potential from transmission of disease from people to the animals and vice versa.

Full details will be provided in accordance with the EAP Act requirements when Sydney Zoo is applying for a licence under that Act.

3.13 Contributions

No Section 94 or Section 94A Plans exist for the site, therefore no contributions are payable.

3.14 Analysis of Alternatives

Strategic need for the proposal

The proposal is needed to support the vision of the wider Western Sydney Parklands Master Plan, and to provide a world-class tourist facility for Western Sydney. The Parklands Plan of Management (2010) identifies the Bungarribee Precinct as

> *An emerging hub for regional passive recreation, tourism, social and cultural activities…*

The Plan of Management identifies that the Parklands currently offer limited tourism opportunities, however through the selection of a number of sites suitable for development as tourism hubs, can by 2020 provide various opportunities for tourists to visit the Parklands. The long term land area identified as suitable for use as a tourism hub, across the whole Parklands area, equates to 1%, or 52ha in total, compared to only six hectares at present. Sydney Zoo was the winner of a competitive tender process where alterative potential land uses were considered by the WSPT.

Alternative Design Options

A number of design options were identified as part of the concept design process.

Option 1 – Do Nothing
In May 2013 the WSPT invited prospective proponents to submit responses to a Request for Proposals to provide a tourism facility within the Bungarribee Precinct of the Western Sydney Parklands. Sydney Zoo was the successful tenderer, and entered into a lease agreement with the WSPT on 5 December 2014.

If this project does not proceed, the lease agreement between Sydney Zoo and the WSPT will be void, potentially resulting in contractual penalties for both parties. The subject site would remain as an unutilised portion of land within the wider Bungarribee Parkland, and not achieve the goals of the Western Sydney Parklands Plan of Management, which identifies a tourism hub on the proposed Zoo site. Furthermore, the area will remain as an underutilised and inefficient use of land.

Option 2 – Zoo Concept 1
The original concept design for the Zoo was a confusing structure and layout, which did not allow for the logical sequencing of animal exhibits. Additionally, the spatial layout did not utilise the space on the site in an efficient manner. This scheme required the removal of all identified protected vegetation on-site, particularly in the southern portion where the proposed car park is located.

Figure 14 – Zoo Concept 1
Source: Aspect

Option 3 – Zoo Concept 2
While having an interesting internal path network, Concept 2 required double movement of patrons to see various exhibits. This was determined to be unsustainable and inefficient. Additionally, the scheme did not utilise all available space in a suitable manner, and did not allow for flexibility for future expansion. This option did attempt to save as much protected vegetation as possible in the southern part of the site; however this resulted in an inefficient and impractical car park layout.

Figure 15 – Zoo Concept 2
Source: Aspect

Option 4 – Zoo Concept 3
Concept 3 proposed a complex path network which would introduce confusion for patrons. Accordingly, the animal exhibits could not be sequenced in an interesting way. This scheme had a similar car park structure to Concept 2, in attempting to retain the protected vegetation on-site, however resulting in an inefficient car park layout.

Figure 16 – Zoo Concept 3
Source: Aspect

Option 5 – Zoo Concept 4
Concept 4 (the selected masterplan) provides an efficient and interesting internal pathway, through utilising the natural topography of the land as much as possible, with the main spine of the path network running along the top of the existing ridgeline on site. This allows for the park to be effectively divided into native species (in the eastern portion) and exotic species (to the west). Additionally, the topography allows for a naturally flowing creek to be installed on-site providing stormwater management for the Zoo.

Options Analysis
The proposed development of the Zoo as outlined in this SSD report provides many advantages with limited constraints. These advantages include:

- A purpose built zoological facility that will help achieve the wider Bungarribee Master Plan's key objective of creating a tourism hub;
- Introduction of a new tourist facility for the growing population of Western Sydney;
- Direct access from a key road link;
- Retention of viable protected vegetation;
- Educational opportunities for visitors; and
- Availability of land for future expansion (which would be subject to a separate planning application).

Given these advantages, Option 5 (Zoo Concept 4) was selected to progress the development application for the Zoo on the site.

4.0 Consultation

In accordance with the SEARs issued for this project, ongoing consultation has been undertaken with relevant public authorities, the community and Blacktown Council.

The proposed development will be placed on public exhibition for 30 days in accordance with Clause 83 of the Environmental Planning and Assessment Regulation 2000. During the public exhibition period Council, State agencies and the public will have an opportunity to make submissions on the project.
Environmental Assessment

4.1 Sydney Zoo Communications and Stakeholder Consultation

Sydney Zoo engaged JBA to provide communications and stakeholder engagement services for the project. The consultation program included engagement with the local community, neighbours and key stakeholders to present the proposal and gather feedback.

The consultation activities ensured that all stakeholders were informed about the proposal and had the opportunity to provide feedback prior to the submission of the SSD application. The feedback received during the initial consultation process has been considered during the preparation of the SSD application and EIS report.

The consultation summary report will be updated to include feedback received from consultation activities held during the public exhibition period later this year.

The communications and stakeholder engagement activities to date have included:

- a media launch to announce the Sydney Zoo project;
- a consultation website to provide a hub of information about the project and collect feedback ;
- online engagement via Facebook, Instagram and Twitter;
- stakeholder consultation with relevant authorities, agencies and organisations;
- postcard notification to 4,500 surrounding residents and businesses;
- newspaper advertisements in the Blacktown Sun and Blacktown Advocate to promote consultation opportunities to the wider community; and
- a community information session at the Bungarribee Resource Centre Community Hub to enable the wider community to view the plans and provide feedback.

Consultation Outcomes

Media launch

A media launch was held on 7 September 2015 at the Bungarribee Super Park. The Minster for Environment, the Hon Mark Speakman announced Sydney Zoo's plans to bring the $36 million tourist attraction to Western Sydney. This event was attended by a wide range of key stakeholders including Members of Parliament, representatives from state and local government, peak bodies, strategic partners and a wide range of major metropolitan and regional media outlets.

The Sydney Zoo launch received wide spread positive media coverage with all the main key messages being included in the reports across a number of major metropolitan and regional media outlets including:

- Sydney Morning Herald;
- The Daily Telegraph;
- The Australian;
- Blacktown Sun;
- Blacktown Advocate;
- The Mount Druitt Star;
- Penrith Press;
- Channel Ten news;
- Nine Network news;
- Prime news;
- 107.3FM;
- 702 ABC; and
- A range of online news websites.

Project website

The project website www.talksydneyzoo.com was launched alongside the media announcement on 7 September 2015. The project website includes information about the site, the proposal, the planning process, partnerships and consultation opportunities. The project website will be active until the end of the public exhibition.

An online feedback form on the website allowed people to comment and register to the mailing list. A contact email address and phone number were also listed with visitors encouraged to send through any questions or concerns to the project team

The website has had over 4,500 views and 98 phone and email enquiries have been received by the project team to date. The key topics of the enquiries have included:

- positive comments and excitement regarding opening of the zoo;
- clarifying the location of the site;
- animal welfare;
- future job opportunities;
- future business opportunities; and
- the potential traffic and construction impacts.

Social media

Sydney Zoo has engaged with the local community and stakeholder online via Facebook, Instagram and Twitter. The Sydney Zoo Facebook page has received a total of 3,489 likes to date. Project updates, images and consultation details have been published via social media channels.

A Facebook advertising campaign was launched on 14 September 2015, to ensure users could easily find the Sydney Zoo page and received the latest project information.

Stakeholder consultation

Sydney Zoo has consulted with the following authorities, agencies and organisation to date:

- NSW Department of Premier and Cabinet;
- NSW Department of Primary Industries – Exhibited Animals Advisory Committee;
- NSW Office of Environment and Heritage;
- NSW Environment Protection Authority;
- Western Sydney Parklands Trust;
- NSW Office of Water;
- NSW Health;
- SafeWork NSW;
- Transport for NSW;
- Busways;
- Blacktown City Council
- Blacktown Police Command;
- The University of Western Sydney;
- Featherdale Wildlife Park;
- Aboriginal community groups; and
- Taronga Zoo.

Community information session

A total of 47 people attended the Sydney Zoo community information session held on 22 October 2015 at the Bungarribee Community Centre Resource Hub.

The session was advertised via 4,500 postcards, which were distributed to the local community and advertisements were published in the Blacktown Sun and Blacktown Advocate two weeks prior to the event.

The proposal was presented via a series of exhibition boards, a video presentation and a large scale map of the masterplan. Members of the project team and Sydney Zoo senior management were also in attendance to answer questions and discuss the proposal.

Visitors were invited to register their names and contact details to subscribe to the project mailing list, and also register any comments they had via feedback forms. The feedback received during the community information session was overwhelmingly positive, with the majority of people welcoming the proposal and requesting to stay informed during the planning and development process.

The key topics discussed are listed below with reference to where this EIS address the issue:

- positive comments about the project and excitement for opening of the Zoo. This SSD is the first step in the approval process for the Zoo;
- discounted tickets for Bungarribee residents and families. This comment has been noted however no pricing structures have yet been determined;
- noise impacts. Refer to **Section 6.2** for an assessment of noise;

- car parking. Refer to **Section 6.3** for details on car parking requirements;
- alignment of the project with the WSPT master plan. Refer to **Section 2.4** and **Section 5.3.4**;
- funding arrangements with the WSPT and what they plan to do with revenue received from the lease of Sydney Zoo. Refer to **Section 6.14**;
- impacts on Featherdale Wildlife Park. An assessment has been provided in **Section 6.14**;
- increased traffic and access via Great Western Highway. See **Section 6.3**;
- connections with the Western Sydney Parklands via bike paths. Refer to **Section 6.3**;
- construction impacts. See the relevant parts within **Section 6.0**;
- wildlife conservation. Refer to **Section 3.12.3**; and
- future consultation opportunities as discussed in this section.

A second community information session will be held during the public exhibition period of the EIS and SSD application to provide the community and stakeholders with further opportunity to view the plans and provide feedback.

4.2 Secretary's Environmental Assessment Requirements Consultation

As part of the SEARs received for the project, a number of key public authorities provided comment and requested various inputs be provided as part of the EIS documentation. These have been summarised in **Table 6** below, with reference to the relevant section of this EIS where applicable.

Table 6 – Public authorities SEARs requested information

Requirement	Location in Environmental Assessment	
Environmental Protection Agency		
General	**Report / EIS**	**Technical Study**
▪ air quality (including dust emissions during construction)	Section 6.1	Appendix O
▪ noise and vibration during construction and operational phases of the project	Section 6.2	Appendix N
▪ waste management in the context of the waste management hierarchy	Section 6.7	Appendix Q
▪ soil erosion and sedimentation particularly during the construction phase	Section 6.4	Appendix G
▪ radiation control associated with veterinary services	There will be no radiation materials stored or used on site.	
▪ construction and operational water quality impacts	Section 6.4	Appendix F
▪ water conservation and energy efficiency	Section 6.13	Appendix P
▪ cumulative environmental impacts	The Sydney Zoo is located within the Western Sydney parklands, and is isolated from surrounding development. It takes access directly from Great Western Highway, and there are no other developments (applications or approvals) that have not already been taken into account as part of the background traffic growth. The following cumulative impacts have been assessed in the EIS: ▪ Potential cumulative odour impacts	

Requirement	Location in Environmental Assessment	
	are assessed in Appendix O. ▪ Cumulative noise impacts are assessed in Appendix N.	
Construction Phase: Contamination	**Report / EIS**	**Technical Study**
Contamination, including detailed information on: ▪ groundwater (example: depth and any likely impact to groundwater), ▪ any fill material and illegally dumped waste, and ▪ potential impacts from demolished buildings and infrastructure.	Section 6.9	Appendix H
Waste Management	**Report / EIS**	**Technical Study**
Waste Management – the proponent should commit to: ▪ Managing waste in accordance with the waste management hierarchy established under the Waste Avoidance and Resource Recovery Act 2001, ▪ Ensuring all wastes generated during the project are properly assessed, classified and managed in accordance with the EPA's guidelines to ensure proper treatment, transport and disposal at a landfill legally able to accept those wastes.	Section 6.7	Appendix Q
The EIS should identify the nature and scope of clinical and related waste likely to be generated during operation of the zoo and the measures proposed to handle, store, transport and dispose of those wastes.	Section 6.7	Appendix Q
The EIS should identify how the proponent will ensure compliance with any relevant trackable waste requirements of Part 4 of the Protection of the Environment Operations (Waste) Regulation 2014 in relation to clinical and related waste generated in the course of zoo operations.	Section 6.7	Appendix Q
Asbestos Sheeting	**Report / EIS**	**Technical Study**
The proponent should confirm whether asbestos containing material is evident on the site. ▪ The proponent be required to satisfy the requirements of the Protection of the Environment Operations (Waste) Regulation 2014 with particular reference to Part 7 'asbestos wastes'. ▪ The proponent should be required to consult with Workcover NSW concerning the handling of any asbestos waste.	No asbestos containing material is evident on the site. See Section 6.9.	Appendix H
Dust Control and Management	**Report / EIS**	**Technical Study**
The proponent should commit to: ▪ (a) minimising dust emissions on the site, and ▪ (b) preventing dust emissions from the site.	Section 6.1	Appendix O
Erosion and Sediment Control	**Report / EIS**	**Technical Study**
The EIS should identify how the proponent will implement erosion and sediment control measures consistent with the practices and principles in - ▪ Managing Urban Stormwater Soils and Construction, Volume 1, 4th Edition, 2004, and ▪ Managing Urban Stormwater Soils and Construction Volume 2A Installation of Services.	Section 6.4	Appendix F
Noise	**Report / EIS**	**Technical Study**
The EIS should- ▪ (a) identify surrounding noise sensitive land uses, and ▪ (b) incorporate a comprehensive noise impact assessment of site preparation, bulk earthworks, construction and construction-related activities, especially any such activities – – likely to generate noise with annoying or intrusive characteristics, or – proposed to be undertaken outside the recommended standard hours discussed in Table 1 to the Interim Construction Noise Guideline (ICNG).	Section 6.2	Appendix N
Construction Noise	Section 6.2	Appendix N

Requirement	Location in Environmental Assessment	
The proponent should commit to : ▪ (complying with the standard construction hours as recommended in Table 1 Chapter 2 of the Interim Construction Noise Guideline, July 2009; ▪ (scheduled intra-day 'respite periods' for construction activities identified in the Interim Construction Noise Guideline as being particularly annoying to surrounding residents and other noise sensitive receivers.		
The proponent should commit to undertaking a safety risk assessment of construction activities to determine whether it is practicable to use audible movement alarms of a type that would minimise the noise impact on surrounding noise sensitive receivers, without compromising safety.	Section 6.2	Appendix N
Operational Noise The EIS should include a comprehensive assessment of noise impacts associated with operation of the zoo together with design for feasible and reasonable noise impact avoidance and mitigation, including but not limited to: ▪ potential sleep disturbance impacts on surrounding residents; ▪ the need to apply 'modifying factors' (see INP chapter 4) to noise monitoring data and associated noise impact assessment; ▪ adequate design, selection and maintenance of noise generating mechanical services (especially air handling plant and equipment and automated valves).	Section 6.2	Appendix N
The proponent should commit to averting unacceptable noise impacts on surrounding noise sensitive receivers by - ▪ preparing a detailed operational noise impact statement that incorporates feasible and reasonable measures to avoid, minimise and manage noise and incorporating those noise avoidance and minimisation measures at the design stage of the project, ▪ establishing and fostering a good relationship with surrounding residents (including facilitation of the logging noise complaints and of obtaining an active and timely response to those complaints); ▪ undertaking a noise monitoring program to 'ground truth' noise impact predictions at set periods following commencement of operation of the new facilities; ▪ restricting loading dock and waste collection activities to 'day-time' as defined in the NSW Industrial Noise Policy, January 2000; ▪ undertaking a noise monitoring program at various periods after commencement of operation of the each project element to verify that measured noise levels do not exceed levels predicted in the required noise impact statement and acceptable noise levels identified in the NSW Industrial Noise Policy, January 2000.	Section 6.2	Appendix N
Radiation Control	**Report / EIS**	**Technical Study**
The EIS should include details of consultation with the Environment Protection Authority in regard to any necessary amendment to the Western Sydney Local Health District 'radiation management licence' in respect of regulated material at the new facilities and the management and handling of waste containing radioactive material.	There will be no regulated radiation materials stored or used on site and no waste containing radioactive materials generated at the site. No radiation management licencing arrangements are required.	
Water Quality	**Report / EIS**	**Technical Study**
The EIS should provide a detailed assessment of potential operational impacts on water quality in Eastern Creek and its tributaries. And should, identify feasible and reasonable measures including rainwater re-use to minimise those impacts.	Section 3.9 and 6.4	Appendix F
The EIS should also explicitly: a) assess existing surface water and groundwater quality against	Section 6.4	Appendix F

Requirement	Location in Environmental Assessment	
relevant criteria for the environmental values of Eastern Creek identified in ANZECC Guidelines for Fresh and Marine Water Quality 2000; b) identify pollutants likely to be generated by project activities, including stormwater runoff, and estimate the concentration and quantity of those pollutants reported against the environmental values and criteria referred to in paragraph (a) above; c) assess the impact of any pollutants referred to in paragraph (b) on surface and groundwater, including Eastern Creek and its tributaries; d) include details of practical measures proposed to be adopted to prevent, control, abate and mitigate any water pollution arising from the project activities; and e) include details of any proposed discharge (nature, volume and location) to receiving waters, including Eastern Creek and its tributaries.		
Ecologically Sustainable Development	**Report / EIS**	**Technical Study**
The EIS should identify and evaluate ▪ practical opportunities to minimise energy use, ▪ practical opportunities to minimise water use, ▪ project water requirements on a total water cycle basis, outlining - – project water requirements and sources, and – total water balances for the project operations with the objective of minimising demands and impacts on external water resources.	Sections 3.8 and 6.13	Appendix P
Office of Environment and Heritage		
Aboriginal Heritage	**Report / EIS**	**Technical Study**
As per above SEARs – consultation with Aboriginal people where Aboriginal cultural heritage values are identified.	Section 6.5	Appendix M
Preparation of Heritage Impact Assessment	Section 6.5	Appendix M
Biodiversity	**Report / EIS**	**Technical Study**
Impacts on the following species, populations and ecological communities will require further consideration and provision of the information specified in s9.2 of the Framework for Biodiversity Assessment: ▪ Threatened Flora – Downy Wattle *(Acacia pubescens)* (only requires further consideration if greater than 5 individuals will be impacted by development) – G*revil!ea juniperina* ssp. *juniperina* (only requires further consideration if greater than 5 individuals will be impacted by development) – *Marsdenia viridiflora* ssp. *viridif!ora* – Spiked Rice Flower *(Pimelea spicata)* (only requires further consideration if greater than 2 individuals will be impacted by development) – *Pultenaea parviflora* (only requires further consideration if greater than 10 individuals will be impacted by development) ▪ Threatened Fauna – Little Bentwing-Bat *(Miniopterus australis)* (only if maternity or roost sites are impacted) – Grey-headed Flying-fox *(Pteropus poliocephalus)* (only if camps are impacted)	Section 6.10	Appendix I
Flooding	**Report / EIS**	**Technical Study**
The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including: ▪ Flood prone land ▪ Flood planning area, the area below the flood planning level.	No development is proposed within Blacktown Council's Medium Flood Risk Category area. The Medium Flood Risk Category area is defined as the area that is below the 100 Annual Recurrence Interval	

Requirement	Location in Environmental Assessment
▪ Hydraulic categorisation (floodways and flood storage areas).	(ARI) flood level that is subject to a low hydraulic hazard (in accordance with the provisional criteria outlined in the N.S.W. Government Floodplain Development Manual 2005). Site works will intrude into Blacktown Council's Low Flood Risk Category area, which is defined as being all land within the floodplain, i.e. within the extent of the Probable Maximum Flood (PMF) but not identified as either high flood risk or medium flood risk. Therefore works proposed to be carried out within the Low Flood Risk area would impact on land that is between the 100 year ARI flood extent and the PMF flood extents. This has been a specific design response to the identified flood zones adjacent to Eastern Creek. Flood modelling is not normally required if there is no development within the 100 year ARI flood extent. As such, detailed flood modelling has not been carried out as part of this EIS.
The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 1 in 10 year, 1 in 100 year flood levels and the probable maximum flood, or an equivalent extreme event.	
The EIS must model the effect of the proposed Sydney Zoo project (including fill) on the flood behaviour under the following scenarios: ▪ Current flood behaviour for a range of design events as identified in 11 above. This includes the 1 in 200 and 1 in 500 year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.	
Modelling in the EIS must consider and document: ▪ The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood. ▪ Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories. ▪ Relevant provisions of the NSW Floodplain Development Manual 2005.	
The EIS must assess the impacts on the proposed Sydney Zoo project on flood behaviour, including: ▪ Whether there will be detrimental increases in the potential flood affectation of other properties, assets and infrastructure. ▪ Consistency with Council floodplain risk management plans. ▪ Compatibility with the flood hazard of the land. ▪ Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land. ▪ Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site. ▪ Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses. ▪ Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council. ▪ Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the SES and Council. ▪ Emergency management, evacuation and access, and contingency measures for the development considering the full range or flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES. ▪ Any impacts the development may have on the social and economic costs to the community as consequence of flooding	

Blacktown City Council		
Air Quality Impact Assessment	**Report / EIS**	**Technical Study**
An air impact assessment must be conducted by a suitably qualified expert in line with the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (EPA 2011) which includes: ▪ All processes and scenarios that could result in air pollution and/or generation of odour, this must also include worst case scenarios. ▪ An assessment of the air quality impacts arising from the project on surrounding sensitive receptors (particularly dust and odour).	Section 6.1	Appendix O

Requirement	Location in Environmental Assessment	
▪ Provide an air pollutant management plan that includes details of the various methods that will be employed to control pollutants both during the construction and operational phases.		
Noise Impact Assessment	**Report / EIS**	**Technical Study**
Determine the existing background ambient noise levels in accordance with the *NSW Industrial Noise Policy, 2000.*	Section 6.2	Appendix N
Determine the existing road traffic noise levels in accordance with the *NSW Road Noise Policy.*	Section 6.2	Appendix N
Conduct a noise assessment by a suitably qualified consultant in accordance with *NSW Industrial Noise Policy, 2000* that: ▪ Identifies all existing and proposed noise sources, including animal noises. ▪ Identifies any noise sensitive locations which may be affected by activities. ▪ Quantifies the cumulative noise impacts upon the surrounding receivers. ▪ Assesses all construction noise associated with the proposal using the *Interim Construction Noise Guideline* (DECC, 2009). ▪ Specifies the proposed operating hours over a 24 hours period that includes an assessment of the maximum noise levels during the night-time period (10pm-7am). ▪ Assesses any increased road traffic generated at the premises. ▪ Assesses the noise impact associated with use of access roads, internal roads and potential environmental impacts from increased vehicle movements as a result of the proposal.	Section 6.2	Appendix N
Outline the noise management and mitigation measures including appropriate controls for both construction and operational noise.	Section 6.2	Appendix N
Waste Management	**Report / EIS**	**Technical Study**
Identify all waste streams both incoming and outgoing from the premises in accordance with the EPA's Waste Classification Guidelines.	Section 6.7	Appendix Q
Provide details regarding the source, quantity and types of all wastes that will be generated, accepted, handled, processed or treated.	Section 6.7	Appendix Q
Provide details regarding the proposed transportation, receival and handling of waste generated.	Section 6.7	Appendix Q
Detail the extent of any waste that is to be stockpiled including: ▪ Estimated average and maximum amount of materials to be stored at any one time. ▪ Stockpile heights. ▪ The approximate locations of these stockpiles. ▪ Proposed containment of materials and stockpiles. ▪ Fire management and odour from any green waste stockpiles.	Section 6.7	Appendix Q
Assess the estimated emissions arising from the handling, storage, treatment, processing and reprocessing of waste at the site.	Section 6.1	Appendix O
Surface Water and Wastewater Management	**Report / EIS**	**Technical Study**
Describe the intake and discharge of water at the site including: ▪ Volumes; ▪ Water quality; and ▪ Frequency of all water discharges.	Section 6.4	Appendix F
Assess and provide details of all surface water, groundwater and wastewater impacts that are likely to occur during and as a result of discharges at the site.	Section 6.4	Appendix F
Assess all surrounding water bodies and receiving waters that are likely to be affected by the proposal.	Section 6.4	Appendix F
Describe any control measures to be implemented that minimise wastewater generation, erosion, and sediment mobilisation during both construction and operational phases of the proposal.	Section 6.4	Appendix F

<table>
<tr><th>Requirement</th><th colspan="2">Location in Environmental Assessment</th></tr>
<tr><td>Describe how stormwater will be managed both during and after construction.</td><td>Section 6.4</td><td>Appendix F</td></tr>
<tr><td>Describe how predicted impacts will be monitored and assessed over time.</td><td>Section 6.4</td><td>Appendix F</td></tr>
<tr><td>Stormwater Discharge</td><td>Report / EIS</td><td>Technical Study</td></tr>
<tr><td>Stormwater water quality improvement targets are to be achieved on-site prior to discharge, accounting for all bypass. The targets are to be assessed using MUSIC and in accordance with all the requirements of Blacktown City Council's Water Sensitive Urban Design. An electronic copy of MUSIC is to be provided to Council for assessment. The required percentage reductions in post development average annual load of pollutants are:
<table>
<tr><th>Pollutant</th><th>% post development pollutant reduction targets</th></tr>
<tr><td>Gross pollutants</td><td>90</td></tr>
<tr><td>Total suspended solids</td><td>85</td></tr>
<tr><td>Total phosphorous</td><td>65</td></tr>
<tr><td>Total nitrogen</td><td>45</td></tr>
<tr><td>Total hydrocarbons</td><td>90</td></tr>
</table>
Note: As MUSIC does not assess hydrocarbons, a gross pollutant trap targeting hydrocarbons and designed to treat the minimum 6 month flow is deemed to comply.</td><td>Section 6.4</td><td>Appendix F</td></tr>
<tr><td>The development should achieve a minimum of 80% (assessed using MUSIC) of the non-potable water uses on-site being met using rainwater or treated stormwater. Non-potable uses include toilet flushing and landscape watering. Allow for toilet reuse of 0.1 KL/day per toilet/urinal, ignoring any disabled toilet. For watering landscaped areas (ignoring turf areas) allow 0.4 kL/year/m2 as PET-Rain. For bioretention filter areas only (if used) allow 1 kL/year/m2 as PET-Rain. Allow for a 20% loss in rainwater tank size volume in MUSIC compared to that shown on the design plans to allow for anaerobic zones, mains water top up levels and overflow levels.</td><td>Section 6.4</td><td>Appendix F</td></tr>
<tr><td>Provide two additional MUSIC models (pre and post) to demonstrate that the Stream Erosion Index is less than 3.5 based on the technique in Council's MUSIC Modelling Guide in part 4 of the Developer Handbook for Wafer Sensitive Urban Design available on Council's website.</td><td>Section 6.4</td><td>Appendix F</td></tr>
<tr><td>Design an on-site detention basin to mitigate all post developed flows from the site to not exceed pre developed rural catchment flows (with an initial pervious loss of 15 mm) for all storm events from 1 in 2 year ARI to 1 in 100 year ARI. This design is to be supported by electronic modelling that complies with the requirements of the Council's Engineering Guide for Development 2005 and account for any bypass of the detention basin. The spillway should be designed to cater for the PMF event with scour protection and ensuring the stability of the basin wall.</td><td>Section 6.4</td><td>Appendix F</td></tr>
<tr><td>All development including carparks are to be above the 1 in 100 year ARI flood level. Any building floor levels are to be above the 1 in 1 00 year ARI flood level plus 0.5 m.</td><td colspan="2">All development is above the 100 year ARIO flood level.</td></tr>
<tr><td>Prepare a Flood Management Plan for the site.</td><td colspan="2">No works are proposed to be carried out within the 100 year ARI flood extent and all development will be above the flood planning level. A Flood Management Plan is not considered necessary.</td></tr>
<tr><td>Develop a Vegetation Management Plan for the restoration of the Eastern Creek Embankment with endemic riparian vegetation within the floodplain.</td><td colspan="2">No works are proposed within 40m of Eastern Creek. WSPT has undertaken substantial planting through the Eastern Creek riparian corridor, and this regrowth forest will largely be retained, except for a</td></tr>
</table>

Requirement	Location in Environmental Assessment	
	small amount of clearing of the regrowth is required to provide for the overflow car park. Retained riparian corridor vegetation will be undisturbed during development works for the Sydney Zoo. Restoration of Eastern Creek is not expected to be required, and no Vegetation Management Plan has been prepared.	
Building	**Report / EIS**	**Technical Study**
Access report for the entire built environment	Section 3.6	Appendix X
Traffic and Transport	**Report / EIS**	**Technical Study**
Plan of Management to consider peak visitor periods, parking for staff, bus parking and layovers, drop off zones, permanent visitor and overflow visitor parking	Section 6.3	Appendix E
The Plan should also make provision for when recreational uses within the wider Bungarribee Park are accessible to the public	Section 6.3	Appendix E
Clarify access to the new internal access road and the site, including detailing is the potential intersection upgrade works comprise left in-left out access, etc.	Section 6.3	Appendix E
Ensure the Traffic Impact Assessment specifically addresses any impact on Doonside Road and the future intersection with Doonside Road that would be utilised by the Zoo patrons.	Sydney Zoo will not be connected to Doonside Road, and zoo patrons will not be able to access Sydney Zoo via Doonside Road. No proposal has yet been prepared by WSPT for a possible future internal connecting road between Doonside Road and Great Western Highway. If in the future WSPT propose this internal connecting road, WSPT will be responsible for assessing the impacts on the local traffic network.	
Planning Matters	**Report / EIS**	**Technical Study**
Bushfire Risk Assessment Report	Section 6.11	Appendix I
Provide details of the expected finished ground levels, cut and fill, bulk earthworks and retaining works. Should importation of fill be required, include a draft Management Plan detailing the source of fill, truck routes (in particular if routes are past residential properties) and the quantity of imported fill.	Import of approximately 15,000m3 of fill will be required. This material will likely be sourced from tunnelled infrastructure projects in North West Sydney, and will be delivered entirely via the State Road network (i.e. M2, M7, M4, Wallgrove Road and Great Western Highway).	Details of finished ground levels, earthworks and retaining structures are provided in Appendix G.
Should any evening or night activities be held, provide specific details and consideration of these activities (such as evening concerts) in light of potential adverse impacts on the nearby residential properties.	Approval for structured or organised night activities is not sought.	
The Preliminary Environmental Assessment Report states that a new substation is to be provided. The Proponent is requested to consult with the energy provider. The location and details of the substation are requested to be nominated on the plans.	A new electricity kiosk will need to be provided near the entrance of the site, subject to requirements of electricity supply authority. This is the responsibility of the WSPT.	
It is noted that there are minimal staff facilities and amenities for up to 100 staff. The EIS is to demonstrate that appropriate facilities are available to serve the needs of the staff.	Sydney Zoo provides amenities and facilities for a range of staffing level, with dedicated staff amenities and facilities located in the amenities building, the Boma and the entry/exit building. In addition, it is highlighted that the zoo itself provides	

Requirement	Location in Environmental Assessment	
	amenities and facilities to cater for thousands of visitors - including toilets, picnic areas, and restaurant. Staff will also be able to use these amenities and facilities. As such, there are more than ample amenities and facilities for staff throughout Sydney Zoo.	
Undertake continued consultation with public transport providers. It is noted that the Preliminary Environmental Assessment Report states that two Busway routes already service the site from Blacktown Station. It is recommended that the Proponent also investigates bus services from Doonside Station, and/or shuttle services to suitable locations.	Sydney Zoo is continuing consultation with TfNSW in relation to providing additional bus services to the site.	
Provide details of any business identification and general signage, including details of illumination, if relevant. The proposal is to satisfy the requirements of SEPP 64 Advertising and Signage. Provide a plan which details way finding signage and lighting to ensure that vehicular, pedestrian and cycle movement through the site is clearly communicated. Particular attention is to be paid to signage which manages overflow parking and ingress/egress to and from the site and the new access road.	Section 6.9	Appendix U and Appendix Y
Confirm if the proposed parking comprises any parking fees or timing restrictions. If this is the case, details are requested to be provided as to how this will be managed and the application of any parking fees.	It is not Sydney Zoo's intention to impose parking fees or timing restrictions.	
Provide details of security and safety measures to be implemented, including any after-hours measures for staff. Also confirm if the parking area is to be closed to the public after-hours, whilst also maintaining after-hours access for staff and emergency vehicles.	Section 3.11. The parking area may be closed outside of hours if this is warranted to ensure site safety and security.	-
Department of Primary Industries – Water		
Water Sharing Plans	**Report / EIS**	**Technical Study**
Demonstrate how the proposal is consistent with the relevant rules of the Water Sharing Plan including rules for access licences, distance restrictions for water supply works and rules for the management of local impacts in respect of surface water and groundwater sources, ecosystem protection (including groundwater dependent ecosystems), water quality and surface-groundwater connectivity.	The proposal does not include accessing water from surface or groundwater water sources and water supply licencing is not required.	-
Provide a description of any site water use (amount of water to be taken from each water source) and management including all sediment dams, clear water diversion structures with detail on the location, design specifications and storage capacities for all the existing and proposed water management structures.		
Provide an analysis of the proposed water supply arrangements against the rules for access licences and other applicable requirements of any relevant WSP, including: ▪ Sufficient market depth to acquire the necessary entitlements for each water source. ▪ Ability to carry out a "dealing" to transfer the water to relevant location under the rules of the WSP. ▪ Daily and long-term access rules. ▪ Account management and carryover provisions. ▪ Provide a detailed and consolidated site water balance. ▪ Further detail on licensing requirements is provided below.		
Licensing	**Report / EIS**	**Technical Study**
Identification of water requirements for the life of the project in terms of both volume and timing (including predictions of potential ongoing groundwater take following the cessation of operations at	The proposal does not include accessing water from surface or	-

Requirement	Location in Environmental Assessment	
the site- such as evaporative loss from open voids or inflows).	groundwater water sources and water supply licencing is not required.	
Details of the water supply source(s) for the proposal including any proposed surface water and groundwater extraction from each water source as defined in the relevant Water Sharing Plants and all water supply works to take water.		
Explanation of how the required water entitlements will be obtained (i.e. through a new or existing licence/s, trading on the water market, controlled allocations etc.).		
Information on the purpose, location, construction and expected annual extraction volumes including details on all existing and proposed water supply works which take surface water, (pumps, dams, diversions, etc.).		
Details on all bores and excavations for the purpose of investigation, extraction, dewatering, testing and monitoring. All predicted groundwater take must be accounted for through adequate licensing.		
Details on existing dams/storages (including the date of construction, location, purpose, size and capacity) and any proposal to change the purpose of existing dams/storages.		
Details on the location, purpose, size and capacity of any new proposed dams/storages.		
Applicability of any exemptions under the *Water Management (General) Regulation 2011* to the project.		
Dam Safety	**Report / EIS**	**Technical Study**
Where new dams are proposed, the NSW Dams Safety Committee shall be consulted.	No new dams are proposed	-
Surface Water Assessment	**Report / EIS**	**Technical Study**
As per other agency requests	-	-
Groundwater Assessment	**Report / EIS**	**Technical Study**
As per other agency requests	-	-
If a bore is proposed, then bore construction information is to be supplied to OPI Water by submitting a "Form A" template. OPI Water will supply "GW" registration numbers (and licence/approval numbers if required) which must be used as consistent and unique bore identifiers for all future reporting.	No new groundwater bores are proposed.	-
Groundwater Dependent Systems	**Report / EIS**	**Technical Study**
Identify any potential impacts on GDEs as a result of the proposal including: ▪ the effect of the proposal on the recharge to groundwater systems; ▪ the potential to adversely affect the water quality of the underlying groundwater system and adjoining groundwater systems in hydraulic connections; and ▪ the effect on the function of GDEs (habitat, groundwater levels, connectivity). Provide safeguard measures for any GDEs.	6.10	Appendix I
Watercourses, wetlands and riparian land	**Report / EIS**	**Technical Study**
EIS should include scaled plans showing: ▪ wetlands/swamps, watercourses and top of bank ▪ riparian corridor widths to be established along the creeks; ▪ existing riparian vegetation surrounding the watercourses (identify any areas to be protected and any riparian vegetation proposed to be removed); ▪ the site boundary, the footprint of the proposal in relation to the watercourses and riparian areas; and ▪ proposed location of any asset protection zones.	-	Appendix B
Landform Rehabilitation	**Report / EIS**	**Technical Study**
Justification of the proposed final landform with regard to its impact	No landform	-

Requirement	Location in Environmental Assessment	
on local and regional surface and groundwater systems	rehabilitation is proposed	
A detailed description of how the site would be progressively rehabilitated and integrated into the surrounding landscape		
Outline of proposed construction and restoration of topography and surface drainage features if affected by the project		
An outline of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation.		
Transport for NSW		
Transport and Accessibility	**Report / EIS**	**Technical Study**
Traffic Impact Assessment for Construction and Operation, including daily and peak hour event trips, assessment of impacts and mitigation measures	Section 6.3	Appendix E
Roads and Maritime Services		
Details on daily and peak traffic movements, proposed accesses, parking provisions and compliance with AS, service vehicle movements etc.	Section 6.3	Appendix E
Traffic Management Plan for all demolition/construction activities, detailing vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures.	Section 6.3	Appendix E

5.0 Statutory and Strategic Context

5.1 Legislation

The following legislation applies to the proposed development of the Zoo.

5.1.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or on the environment of Commonwealth land.

A Protected Matters Search (**Appendix V**) identified 22 listed threatened species as being within a two kilometre radius of the site, with one area of Commonwealth Land (Telstra Corporation Limited). Further assessments completed by Eco Logical Australia have concluded that the proposal is unlikely to have a significant impact on any of the identified ecological matters of national environmental significance.

An assessment of the proposal's impact on matters of national environmental significance under the EPBC found that there is unlikely to be a significant impact on any matters of national environmental significance or on the environment of Commonwealth land (refer to **Appendix A** and **Appendix I**). Accordingly, the proposal has not been referred to the Australian Government Department of Environment.

5.1.2 Environmental Planning and Assessment Act 1979

Development consent for the proposed Zoo will be required under Part 4 of the EP&A Act. The proposal is declared to be SSD under Section 89C of the EP&A Act. As the proposed development constitutes SSD the Minister for Planning (or delegate) will be the consent authority. This EIS responds to the requirements set out in Schedule 2 of the EP&A Regulation as required for the SSD application.

5.1.3 Exhibited Animals Protection Act 1986

The *Exhibited Animals Protection Act 1986* (EAP Act) identifies the need for approvals to be given for the Zoo to exhibit animals, with certain animals requiring specific permits. The EAP Act will ensure the safety and well-being of animals through the design and approval of animal enclosures, and covers a range of areas including:

- psychological and physical animal welfare;
- educational value of exhibits;
- public safety; and
- legal effect of licencing requirements on animal exhibitors.

During the detailed design of the proposed Zoo, Sydney Zoo will submit an application for Approval to Construct an Animal Display Establishment, and an application for a permit to exhibit any species within Schedule 2 of the Exhibited Animals Protection Regulation 2010. These species are those who require specialist care, pose a threat to keeper or public safety, present a danger to agriculture or the environment and subject to studbook or cooperative conservation programs conducted under the Australasian Species Management Program.

Additionally, Sydney Zoo will be required to comply with various standards contained under the General Standards for Exhibiting Animals in NSW in order to receive a licence. An inspection of the completed exhibits, post-construction, will be conducted by an inspector authorised by the Minister or by an Exhibited Animals Advisory Committee member in the company of such an inspector. Satisfaction that the applicable standards are complied with will include an assessment of:

- The exhibit space and shelter provided for the animals, including safety, exhibit furniture and environmental complexity;
- Hygiene (including handwashing) and first aid facilities for members of the public (including zoo visitors);
- Animal diet;
- Animal identification techniques;
- Details of veterinary arrangements for each animal;
- Details of food storage and preparation areas, as well as post mortem facilities;
- Details of educational material that will be provided to the public concerning the conservation of animals for each enclosure / exhibit; and
- Details of appropriately qualified staff and their responsibilities.

Upon completion of a satisfactory inspection, the relevant issue fee will be paid by Sydney Zoo and then the licence issued. Sydney Zoo will only be permitted to acquire animal specimens for exhibition after a licence has been issued.

5.1.4 Roads Act 1993

No road works are expected to be required. The intersection of the Parkland Access Road and the Great Western Highway has already been upgraded and is suitable to accommodate Zoo traffic.

5.1.5 Threatened Species Conservation Act 1995

The proposed works, whilst involving removal of vegetation and works within a vegetated area are not likely to cause significant effect on any threatened species, populations or ecological communities, or their habitats as listed under the *Threatened Species Conservation Act 1995*. Refer to **Section 6.10** for further details.

5.1.6 Contaminated Land Management Act 1997

The site is not listed as a contaminated site under the *Contaminated Land Management Act 1997* and therefore the provisions of the Act do not apply to the proposal.

5.1.7 Biosecurity Act 2015

The *Biosecurity Act 2015* was passed through the NSW Government in September 2015, and replaces (wholly or partly) 14 pieces of existing biosecurity legislation. The *Biosecurity Act 2015* will assist in maintaining internationally recognised biosecurity measures and standards, facilitate faster and more targeted responses in emergency situations and support industry-led biosecurity solutions. Under the *Biosecurity Act 2015*, people carrying out relevant operations (including Sydney Zoo) have a range of obligations in terms of preventing biosecurity risks. Sydney Zoo will comply with its obligations under this Act when it comes into force in 2017.

5.1.8 Legislation which is not applicable

Under Section 89J(1) of the EP&A Act, the approvals generally obtained through the following legislation do not apply to SSD.

Water Management Act 2000

There are no works proposed within 40m of Eastern Creek, which would normally trigger the requirement for a Controlled Activity Approval. This approval would not otherwise be required for this application notwithstanding Section 89J of the EP&A Act.

Rural Fires Act 1997

A bushfire safety authority is generally issued under Section 100B of the *Rural Fires Act 1997* if the proposed works are for the purposes of residential or rural subdivision. The proposed works are for the development of commercial premises and therefore would not otherwise require approval under this Act, outside of Section 89J of the EP&A Act.

Heritage Act 1977

There are no identified items of heritage significance that would require an approval under the *Heritage Act 1977* located within the footprint of the proposed Zoo.

Fisheries Management Act 1994

There are no works occurring within a watercourse or that will impact on aquatic ecology. No approval would otherwise be required under the *Fisheries Management Act 1994*.

Native Vegetation Act 2003

Under Section 89J of the EP&A Act, if consent is obtained for the SSD which incorporates the removal of native vegetation, no approval under the *Native Vegetation Act 2003* would be required.

National Parks and Wildlife Act 1974

The site is not reserved under the *National Parks and Wildlife Act 1974*.

5.2 Environmental Planning Instruments

5.2.1 State Environmental Planning Policy (Western Sydney Parklands) 2009

The State Environmental Planning Policy (Western Sydney Parklands) 2009 (Western Sydney Parklands SEPP) applies to the subject site, and (amongst others) aims to allow a diverse range of recreational, entertainment and tourist facilities in the Western Parklands, while encouraging education and research.

It is considered that the proposed Sydney Zoo complies with these aims, as the Zoo will be a significant tourist attraction for visitors and locals within the area, as well as performing valuable education and research roles.

Under the Western Sydney Parklands SEPP the land is unzoned. This allows for all development to be either permissible with development consent or permissible without development consent. Development that is proposed by anyone other than a public authority requires development consent. As the proponent is not a public authority, development consent is required under the EP&A Act.

Furthermore, proposed signage must be consistent with the signage policy prepared by the WSPT, as required under Clause 16. However, no signage policy has been prepared by the WSPT in relation to the proposed Sydney Zoo. Further detail is provided in **Section 6.8.2**.

5.2.2 State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) was adopted on 1 October 2011 and identifies SSD.

Pursuant to Clause 5 of Schedule 2 of the SRD SEPP identifies that 'development that has a capital investment value of more than $10 million on land identified as being within the Western Parklands' is declared to be SSD for the purposes of Section 89C of the EP&A Act.

Consequently, the Zoo is SSD requiring assessment under Part 4 of the EP&A Act with the Minister as the consent authority.

5.2.3 State Environmental Planning Policy (Infrastructure) 2007

The Site is located adjacent to a classified road (Great Western Highway) and within close proximity to the M7 Westlink and is therefore subject to the provisions of the State Environmental Planning Policy (Infrastructure) *2007* (ISEPP).

Under Clause 101 of the ISEPP, development with frontage to a classified road is required to ensure that the new development does not compromise the operation and function of classified roads, and is to prevent or reduce the potential impact of traffic noise on development adjacent to classified roads.

The proposed development is considered to be a traffic generating development under Schedule 3 of the ISEPP, due to its access arrangements onto the Great Western Highway. The application is therefore required to be referred to Roads and Maritime Services.

5.2.4 State Environmental Planning Policy No 64 – Advertising and Signage

SEPP 64 contains state-wide planning controls in relation to advertising and signage. When carrying out planning functions under the EP&A Act, SEPP 64 states the consent authority must not grant development consent to an application to display signage unless:

- That signage is consistent with the objectives of the SEPP as set out in clause 3(1)(a);
- That the signage the subject of the application satisfies the assessment criteria specified in Schedule 1; and
- Satisfies any other relevant requirements of the policy.

The proposed signage is consistent with SEPP 64. An assessment is provided in **Section 6.8.2**.

5.2.5 State Environmental Planning Policy No 55 – Remediation of Land

This policy introduces state-wide planning controls for the remediation of contaminated land. It states that a consent authority must not permit development to occur on contaminated land under Clause 7 of the SEPP. A preliminary contamination assessment was carried out for the site (refer to **Appendix H**). This assessment concludes that the site is not contaminated. As such the site is considered to be suitable in its current state for the proposed Zoo and no remediation is required.

5.2.6 State Environmental Planning Policy No 33 – Hazardous and Offensive Development

SEPP33 defines hazardous and offensive development and sets out requirements for considering an application for those development types. The Zoo will not store substantial volumes of dangerous goods and will not pose a significant risk to human health, life, property or the biophysical environment in the locality. It is therefore not a potentially hazardous storage establishment. The Zoo will not create any pollutant discharges in a manner which would have a significant adverse impact on the locality. It is therefore not a potentially offensive establishment. As such, no further comment under SEPP33 is required.

5.3 Strategic Planning

5.3.1 NSW Biosecurity Strategy 2013-2021

The NSW Biosecurity Strategy outlines the overall direction for the management of animal and plant pests, diseases and weeds in the terrestrial and aquatic environments of NSW. It seeks to help achieve the priorities of the State Government outlined in the NSW State Plan 2021, and to maintain and improve the capacity of NSW to respond to, manage and control any biosecurity threats.

The Strategy focuses on biosecurity ricks that impact:

- animal and plant industries such as agriculture, aquaculture, recreational and commercial fishing, and forestry;
- biodiversity and the natural (terrestrial and aquatic) and built environment;
- human health;
- lifestyle, recreation and social amenity; and
- infrastructure and service industries including energy, water supplies and shipping.

The Strategy outlines goals and measures to be implemented to reduce and manage the risk of any biosecurity impacts to ultimately protect the environment, economy and community. The proposed Sydney Zoo will meet the requirements of this Strategy as outlined within this SSD EIS.

5.3.2 NSW State Plan 2021

NSW 2021 is a 10 year plan to rebuild the economy, return quality services, renovate infrastructure, strengthen our local environment and communities and restore accountability to Government.

A section of the Plan is devoted to the rebuilding of the economy through improving the performance of the NSW economy. The proposed development of the zoo will introduce a key economic driver within the growing western Sydney region.

The proposed development is evidently consistent with the goal of the State Plan.

5.3.3 Plan for Growing Sydney

The Plan for Growing Sydney was released in December 2014 and sets out key strategic growth priorities for metropolitan Sydney.

Action 3.2.1 of the Plan is to deliver the Sydney Green Grid project, which specifically includes implementing the Western Sydney Parklands Plan of Management. The Western Sydney Parklands are part of building a sustainable future on the Cumberland Plain and will form part of the Sydney Green Grid. Implementing the Western Sydney Parklands Plan of Management is also specified as a key priority for the West Central Subregion. Delivery of a tourism facility at this site is consistent with the Western Sydney Parklands Plan of Management. As such the Sydney Zoo is consistent with the objectives and actions of A Plan for Growing Sydney.

Also of relevance to this application is the priority around employment growth in the area, which is identified in the Plan for the West Central Subregion.

5.3.4 Western Sydney Parklands Plan of Management 2020

The Plan of Management was adopted in 2011 and provides a strategic vision for the Western Sydney Parklands. A legal document, it outlines the guidelines and objectives for the future development and enhancement of the area.

The Plan of Management recognises the importance of the Parklands in forming a green link between the North West and South West Growth Centres and the challenges associated with ensuring this is maintained.

The Plan of Management identifies that the Bungarribee Precinct has capacity to be significantly improved to become an important recreational and tourism hub, providing additional regional recreation, tourism, social and cultural opportunities for Western Sydney and specifically identifies the Sydney Zoo site for a tourism facility.

6.0 Environmental Assessment

This section of the report assesses and responds to the environmental impacts of the proposed DA. It addresses the matters for consideration set out in the SEARs (see **Section 1.6**).

The Mitigation Measures at **Section 8.0** complement the findings of this section.

The relevant strategies, environmental planning instruments, policies and guidelines as set out in the SEARs are addressed in **Table 2** and **Table 6**.

This chapter addresses the following matters:

- air and odour;
- noise;
- traffic, parking and access;
- water, drainage and stormwater;
- Aboriginal heritage;
- non-Aboriginal heritage;
- waste management;
- landscape character and visual impact;
- vegetation and biodiversity;
- bushfire management;
- hazards and risk;
- ecologically sustainable development;
- infrastructure and servicing;
- accessibility; and
- socio-economic impacts.

6.1 Air and Odour

This section outlines a summary of the Air Quality Impact Assessment prepared by Wilkinson Murray at **Appendix O**. Refer to that report for full details.

6.1.1 Air Quality Criteria

Potential pollutants of air quality for the proposed Zoo include odour during operation and dust during construction.

The air quality criteria are determined from the EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC 2005).

Odour

Odour refers to a complex mix of odours, not arising from a single chemical. Emissions that cause offensive odour to occur at any off-site receptor is prohibited under NSW legislation, with offensive odour determined in the context of its receiving environment, frequency, duration and character. For the purposes of this Zoo, hypothetical odour will be assessed, with odour concentrations defined by odour units (OU).

For developments with the potential for producing odour, air dispersion modelling can be completed to predict the likely odour impact, which looks at the dilution levels of odour at the sensitive receptors off-site. These are measured in OU.

Table 7 – Impact assessment criteria – complex mixtures of odorous pollutants

Population of affected community	Impact Assessment Criteria (OU)
Urban (≥~2000) and/or schools and hospitals	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single rural residence (≤~2)	7.0

Source: Wilkinson Murray (Appendix O)

Given the surrounding environment, an impact assessment criterion of the urban population has been adopted for the Zoo, being 2.0 OU.

Dust and Particulate Matter

The National Environment Protection Measures for Ambient Air Quality by the Australian Government outlines criteria for air quality associated with dust generating activities. Those that are relevant for this development are summarised in **Table 8**.

Currently there are no air quality goals for particulate matter ≤2.5μm ($PM_{2.5}$) within NSW, however the National Environment Protection Measure provides advisory maximum exceedances as follows:

- A maximum 24 hour average concentration of 25 μg/m^3; and,
- An annual average concentration of 8 μg/m^3.

Table 8 – Impact assessment criteria – dust and particulate matter

Pollutant	Averaging Period	Impact	Criteria
Total Suspended Particles (TSP)	Annual	Total	90μg/m^3
Particulate Matter ≤10μm (PM_{10})	Annual	Total	30μg/m^3
	24 hour	Total	50μg/m^3
Deposited dust	Annual	Total	4 g/m^2/month
	Annual	Incremental	2 g/m^2/month

Source: Wilkinson Murray (Appendix O)

6.1.2 Existing Environment

Sydney's temperate subtropical climate is generally characterised by very warm summers and mild, warm winters. Meteorological data for the area surrounding the Zoo site is recorded at the nearby Horsley Park Equestrian Centre Automatic Weather Station (AWS), operated by the Bureau of Meteorology (BOM), approximately seven kilometres south of the site. Temperate data recorded at that site indicates that January is the hottest month with a mean daily maximum temperature of 29.8° C, with July being the coolest month with a mean daily minimum temperature of 5.8° C. On average, there are 77 rain days per year delivering 770mm of rain, with February being the wettest month.

Surrounding the site is a number of sensitive receptors including the Bungarribee residential area (Bungarribee), Eastern Creek residential area (Eastern Creek) and Lot 1 Great Western Highway (R1).

Table 9 – Nearby sensitive receptors to the Zoo site

Receptor/Catchment	Distance from Zoo (metres)
Bungarribee residential area	>700m north
Lot 1 Great Western Highway, Eastern Creek (R1)	250m south
Eastern Creek residential area	>800m west

Source: Wilkinson Murray (Appendix O)

Figure 17 – Surrounding sensitive air quality receptors
Source: Wilkinson Murray (Appendix O)

Local Ambient Air Quality

There are two main potential existing sources of odour in the surrounding area which include the Arnott's biscuit factory approximately one kilometre south-east of the site, and the Eastern Creek Landfill, approximately 2.5km south of the site. Local residents identify noticeable odours from these sites from time to time. No publicly available information could be identified which quantified the extent of odour emissions from either the factory or landfill.

Dust and Particulate Matter

The nearest location where long-term ambient air quality is monitored is the Office of Environment and Heritage (OEH) air quality monitoring site at Prospect, located 4.5km to the east of the Zoo site. Ambient PM_{10} concentrations in the area (described in **Table 10** from results collected between 2012 and 2014) are generally below the criteria.

Table 10 – PM_{10} Monitoring Results for Prospect

Year	Annual Average (µg/m³)	24 Hour Average (µg/m³)	
		Maximum	90th Percentile
2012	17.2	38.7	26.4
2013	19.2	81.8	29.9
2014	17.6	44.3	25.6

Source: Wilkinson Murray (Appendix O)

The Prospect monitoring site does not measure TSP and deposited dust. Estimates can be determined through the relationship with measures PM_{10} concentrations, which assumes that 40% of the TSP is PM_{10}. Applying this relationship to the 2012 annual average PM_{10} concentration at the Prospect site estimates an annual average TSP concentration of approximately 31$\mu g/m^3$.

$PM_{2.5}$ monitoring was commenced at the Prospect site in 2014, with a summary provided between December 2014 and October 2015 in **Table 11**.

Table 11 – $PM_{2.5}$ Monitoring Results for Prospect

Year	Annual Average ($\mu g/m^3$)	24 Hour Average ($\mu g/m^3$)	
		Maximum	90th Percentile
2014/15	8.4	29.6	13.8

Source: Wilkinson Murray (Appendix O)

6.1.3 Potential Emissions

Odour Emissions

The area where animal manure, green waste and food organics are to be stored, in the north-west corner of the Zoo site, is expected to be the most significant source of odour from the project. Animal enclosures are considered to not be a significant source of odour as manure will be collected regularly and taken to the compost area in the north-west corner. The Waste Management Plan (WMP) for the Zoo (discussed further in **Section 6.7**) identifies that 369 tonnes of organic waste will be available for composting each year, which will occur in small windrows within the composting area, not exceeding a total area of 300m^2.

Dust Emissions

Dust emissions will be generated during construction of the project, mainly during the bulk earthworks phase which is expected to last for between three and four months. As this will be the worst case scenario for dust emissions the bulk earthworks will be the focus of this assessment.

Total dust emissions from the bulk earthworks phase (from all significant dust generating activities) are provided in Table 12, with further detailed emissions in Appendix B of **Appendix O**. These represent the total dust emissions over the entire bulk earthworks phase.

Table 12 – Estimated dust and particulate emissions

Activity	Emissions (kg)		
	TSP	PM_{10}	$PM_{2.5}$
Loading/dumping topsoil and fill material	72.3	34	5.3
Dozer shaping fill	1023	216	107
Grader on roads and fill	968	338	30
Wind erosion	672	336	50
Total	2735	924	192

Source: Wilkinson Murray (Appendix O)

6.1.4 Potential Impacts

Construction

During construction, the bulk earthworks phase will generate the majority of dust emissions for an anticipated three to four month period. To predict the impact on annual average pollutant concentrations, the bulk earthwork activities have been conservatively modelled as lasting for an entire year, at the intensity corresponding to the earthworks being complete in only three months.

Total Suspended Particles

The predicted incremental and total 100th percentile annual average concentrations of TSP at the identified sensitive receptors are shown in **Table 13.**

Table 13 – Predicted construction TSP levels

Receptor	Annual Average (criterion - 90 µg/m³)		
	Incremental	Total*	Compliance
Bungarribee	0.6	31.6	Y
Eastern Creek	0.4	31.4	Y
R1	1.7	32.7	Y

*Total impacts include background concentrations

Source: Wilkinson Murray (Appendix O)

PM_{10}

The predicted incremental and total 100th percentile concentrations of PM_{10} at nearby sensitive receptors are provided in Table 14, which includes the total impact on 24 hour averages including the background concentration of PM_{10} as recorded at the Prospect monitoring site during 2012. Contours of the predicted incremental 24 hour average are provided in **Figure 18.**

Table 14 – Predicted construction PM_{10} levels

Receptor	24 Hour Average (criterion = µg/m³)			Annual Average (criterion = µg/m³)		
	Incremental	Total*	Compliance	Incremental	Total*	Compliance
Bungarribee	12.5	**51.2**	N	0.5	17.7	Y
Eastern Creek	5.5	44.2	Y	0.3	17.5	Y
R1	23	**61.7**	N	1.3	18.5	Y

*Total impacts include background concentrations

Source: Wilkinson Murray (Appendix O)

The total impact on 24 hour average PM_{10} concentrations has potential to exceed the impact assessment criterion in Bungarribee and at R1. Therefore, in accordance with the Approved Methods, a contemporaneous assessment of 24 hour average PM_{10} concentrations is required, with requires adding the background PM_{10} concentrations observed at Prospect to the predicted incremental concentrations on a day by day basis. This was completed for the year 2012 and indicates compliance with the impact assessment criterion of 50 µg/m³. Refer to **Appendix O** for the full assessment.

Figure 18 – Predicted maximum 24 hour average PM_{10} concentrations
Source: Wilkinson Murray (Appendix O)

$PM_{2.5}$

The predicted incremental and total 100th percentile concentrations of PM2.5 at nearby sensitive receptors are provided in Table 15, which includes the total impact on 24 hour averages including the background concentration of $PM_{2.5}$ as recorded at the Prospect monitoring site. These predictions indicate that the predicted concentrations of $PM_{2.5}$ are very small compared to the existing concentrations.

Table 15 – Predicted construction $PM_{2.5}$ levels

Receptor	24 Hour Average (advisory goal = 25µg/m³)		Annual Average (advisory goal = 8µg/m³)	
	Incremental	Total	Incremental	Total
Bungarribee	2.6	16.4	0.1	8.5
Eastern Creek	1.2	15	<0.1	8.4
R1	4.8	18.6	0.3	8.7

*Total impacts include background concentrations
Source: Wilkinson Murray (Appendix O)

Deposited Dust

The predicted incremental and total 100th percentile concentrations of deposited dust at nearby sensitive receptors are provided in **Table 16**, which indicates that the total levels comply with the impact assessment criteria.

Table 16 – Predicted construction deposited dust levels

Receptor	Annual Average		Compliance
	Incremental (criterion = 2g/m²/month)	Total* (criterion = 4g/m²/month)	
Bungarribee	0.02	1.42	Y
Eastern Creek	0.01	1.41	Y
R1	0.07	1.47	Y

*Total impacts include background concentrations
Source: Wilkinson Murray (Appendix O)

Operation

During operation of the Sydney Zoo there is potential for a number of odour emitting sources as described in **Section 6.1.3** above. These sources are expected to be located in the north-western corner of the Zoo site. The predicted operational odour impacts on nearby sensitive receptors are outlined in Table 17 with contours shown in **Figure 19**.

Table 17 – Predicted 99th percentile peak odour concentrations

Receptor	Predicted peak odour concentration (OU/m^3)	Impact assessment criterion (OU/m^3)	Compliance
Bungarribee	<1	2.0	Y
Eastern Creek	<1	2.0	Y
R1	<1	2.0	Y

Source: Wilkinson Murray (Appendix O)

Figure 19 – Predicted 99th percentile peak odour concentrations
Source: Wilkinson Murray (Appendix O)

The predicted impacts indicate that the odour concentrations do not exceed the established criterion, and that the 1.0 OU/m^3 contour shown in **Figure 19** does not include any sensitive receptors, meaning that peak odour emissions from the Zoo would not be detectable.

6.1.5 Mitigation Measures

The safeguards and management measures that would be implemented to address the potential air quality and odour impacts are outlined in **Table 18** below.

Table 18 – Air quality and odour safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Air quality emissions – general management	▪ Reduce drop heights during loading and unloading of fill material ▪ Minimise area of exposed surfaces ▪ Minimise amount of stockpiled materials	Construction contractor	Construction

Impact	Environmental Safeguard	Responsibility	Timing
	▪ Where possible, apply barriers, covering or temporary rehabilitation ▪ Rehabilitate completed sections as soon as practicable ▪ Restrict construction activities during unfavourable weather conditions ▪ Water carts and sprays to be used to suppress instances of dust transportation		
Air quality emissions through vehicle movements	▪ All construction plant, equipment and vehicles to be properly maintained and operated so as to alleviate excessive exhaust emissions ▪ Engines of construction plant to be switched off when not in use ▪ Limit vehicle speeds on-site to 40km/h	Construction contractor	Construction
Air quality emissions through loading and transport of materials	Waste and material loads leaving the subject site are to be covered at all times	Construction contractor	Construction
Air quality emissions	Any material deposited on the road network due to truck movements to and from the site would be either prevented or cleaned up immediately.	Construction contractor	Construction
Odour management across the site	▪ Procedures for staff to report the presence of odours, particularly in unexpected places; ▪ If composting windrows require turning, this should be done during periods of good atmospheric dispersion ▪ Maintaining an odour complaints register which captures all complaints from patrons and off-site receptors	Sydney Zoo	Operation

6.2 Noise

This section summarises a Noise and Vibration Impact Assessment prepared by Wilkinson Murray (**Appendix N**).

6.2.1 Noise Criteria

The NSW Industrial Noise Policy (INP) outlines the framework for establishing noise criteria and assessing impacts from industrial noise sources. Under the INP, there are two noise criteria to be satisfied – intrusiveness and amenity. The intrusiveness criterion assesses the likelihood of noise being intrusive above the ambient noise level for residential receivers only. The amenity criterion ensures the total industrial noise level from all sources in the area does not rise above a maximum acceptable level.

Intrusiveness Criteria

The intrusiveness criterion requires that the L_{Aeq} noise level, when measured over 15 minutes, does not exceed the Rating Background Noise Level (RBL) by more than 5 dBA.

Amenity Criteria

Different criteria for amenity apply for different types of receivers (residence, school), locations (rural, suburban) and time periods (day, evening, night). The Zoo site is surrounded by a number of industrial developments however industrial noise was not audible at sensitive receiver (residential developments at Bungarribee and Eastern Creek) locations. This is due to the level of transport and traffic noise in the area. From this, the existing levels of industrial noise at sensitive receivers in

Bungarribee and at R1 is estimated to be less than 40dBA, with Eastern Creek estimated to have a level less than 35dBA due to the increase separation distance from established industrial areas. The adopted amenity criterion for the sensitive receivers near to the site has been adjusted as per **Table 19**.

Project Specific Noise Levels

A single set of criterion is usually established to provide for clarity when assessing noise impacts and takes into consideration the intrusiveness and amenity criterion as described above. Accordingly, the proposed project specific noise levels adopted for this proposal are outlined in **Table 19** (intrusiveness criteria was established using existing background noise levels described in **Section 6.2.2**).

Table 19 – Project specific noise levels

Receiver	Time Period	Criteria (dBA)		Project Specific Noise Level ($L_{Aeq, 15min}$)
		Intrusiveness ($L_{Aeq, 15min}$)	Amenity ($L_{Aeq, period}$)	
Bungarribee, Eastern Creek	Day (7.00am-6.00pm)	51	60	51
	Evening (6.00pm-10.00pm)	50	50	50
	Night (10.00pm-7.00am)	50	43	43
R1	Day (7.00am-6.00pm)	57	60	57
	Evening (6.00pm-10.00pm)	56	50	50
	Night (10.00pm-7.00am)	53	45	45
S1	Busiest 1 hour (when in use)	N/A	45	45

Source: Wilkinson Murray (Appendix N)

Sleep Disturbance

Sleep disturbance is considered to occur when noise events of short duration but high intensity happen, without significantly affecting $L_{Aeq, 15min}$ noise levels. Sleep disturbance levels have been calculated for residential receivers only for between 10.00pm and 7.00am (night). Bungarribee and Eastern Creek have a sleep disturbance screening level of 60dBA, with the R1 receiver a level of 63dBA.

Table 20 – Sleep disturbance screening levels

Receiver Catchment	Night Time (10.00pm-7.00am) RBL (dBA)	Sleep Disturbance Screening Level (dBA – $L_{A1,1min}$ / L_{Amax})
Bungarribee	45	60
Eastern Creek	45	60
R1	48	63

Source: Wilkinson Murray (Appendix N)

Traffic Noise and Construction Noise Criteria

The NSW Road Noise Policy (RNP) outlines guidance on assessing road traffic noise impacts from traffic generating developments. Residences most affected by traffic generated by the proposed Zoo are located along the Great Western Highway to the south and Doonside Road to the east. These two roads are identified as Freeway/arterial/sub-arterial under the RNP. Refer to **Appendix N** for further details.

The NSW EPAs Interim Construction Noise Guidelines (ICNG) recommends noise management levels (NMLs) to reduce the impact of noise arising from construction activities (**Table 21**).

Table 21 – ICNG noise management levels for residential receivers

Time of day	NML $L_{Aeq, 15min}$	How to apply
Recommended standard hours: Monday to Friday 7.00am to 6.00pm Saturday 8.00am to 1.00pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. ▪ Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level ▪ The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. ▪ Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: ▪ Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) ▪ If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	▪ A strong justification would typically be required for works outside the recommended standard hours. ▪ The proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Based on the existing ambient levels in **Table 23**, the construction NMLs for construction activities within standard construction hours are as outlined in **Table 22**.

Table 22 – Project specific NMLs

Receiver	Acceptable $L_{Aeq, 15min}$ Noise Level (Standard daytime construction hours)
Bungarribee, Eastern Creek	56
R1	62
S1	55

Source: Wilkinson Murray (Appendix N)

6.2.2 Existing Environment

To identify the existing noise levels surrounding the Zoo site, unattended noise monitoring was conducted between 15 and 24 September 2015 at two locations (**Figure 20**). Monitoring location L1 (715 Great Western Highway, Eastern Creek) is considered to be representative of a number of isolated residences adjacent to the Great Western Highway, and monitoring location L2 (26 Velocity Parade, Bungarribee) is considered to be representative of the nearest sensitive receivers to the north of the site in Bungarribee, and to the west of the site in Eastern Creek.

The monitors used for this assessment consisted of environmental noise loggers set to A-weighted, fast response. Calibration was checked before and after the survey with no significant drift being noted. The existing ambient noise levels for the area are outlined in **Table 23**, with **Figure 20** indicating the nearest sensitive receivers. The predominant noise source was from existing traffic relating to the Great Western Highway.

Table 23 – Existing ambient noise levels

Monitoring Location	Represented Receivers	Time Period	Noise Levels (dBA)	
			RBL	L_{Aeq}
L1	Bungarribee, Eastern Creek	Day (7.00am-6.00pm)	46	54
		Evening (6.00pm-10.00pm)	45	51
		Night (10.00pm-7.00am)	45	52
L2	R1	Day (7.00am-6.00pm)	52	59
		Evening (6.00pm-10.00pm)	51	58
		Night (10.00pm-7.00am)	48	58

Source: Wilkinson Murray (Appendix N)

Figure 20 – Noise monitoring locations and sensitive receivers
Source: Wilkinson Murray (Appendix N)

6.2.3 Potential Impacts

Construction noise impacts

The construction noise assessment identifies the worst case scenario for noise emissions from the Zoo site. The highest noise emissions will occur during the bulk earthworks phase of the construction process which is planned to last for between three and four months. Construction activities will generally occur during standard construction hours in accordance with the ICNG recommended standard hours:

- Between 7.00am and 6.00pm, Monday to Friday.
- Between 8.00am and 1.00pm Saturdays.

- No work or deliveries on Sunday and/or public holidays.

Noise will be generated through the use of heavy equipment and machinery, including:

- Bulldozer;
- Excavator;
- Dump truck;
- Front end loader;
- Scraper;
- Grader;
- Roller;
- Water cart;
- Compactor; and
- Truck and dog.

These items of plant all have varying sound power and sound pressure levels which contribute to noise emissions. The predicted worse case noise levels where all plant is operating simultaneously are presented in **Table 24** and are all well below the specified NMLs at surrounding sensitive receivers.

Table 24 – Predicted construction noise levels

Receiver	Predicted Noise Level	NML	Exceedance
Bungarribee	36	56	0
Eastern Creek	38	56	0
R1	49	62	0
S1	39	55	0

Source: Wilkinson Murray (Appendix N)

Construction vibration impacts

The Zoo site is significantly setback from nearby receivers, with the nearest development located 200m to the south (the Bungarribee Industrial Estate). Subsequently, it is considered that any vibrations due to construction activities (namely bulk earthworks for a period of between three and four months) will be unnoticeable in those areas, and therefore below the relevant guideline criteria for human comfort and structural damage.

Operational noise impacts

There will be varying levels of noise emission from the proposed Zoo during its operation. Generally, these impacts have been separated into two time periods, being 'opening hours' and 'after hours' as per below:

- Opening hours – 9.00am-6.00pm (extended to 10.00pm during the peak summer period)
- After hours – 6.00pm-9.00am (from 10.00pm to 9.00am during the peak summer period)

Sources of operational noise from the proposed Zoo include patrons, traffic flows, mechanical plant and animals. The most significant sources of noise identified for this assessment of the Sydney Zoo area:

- Mechanical plant, specifically air-conditioning units and exhaust fans;
- Car park vehicle movements;

- Mobile plant, including delivery trucks; and
- Patron noise, namely children.

Detail design of mechanical plant for the Zoo has not yet been completed; however it is assumed that air-conditioning units will be installed in the entry/retail building and the administration building, and exhaust fans in the Boma. These are assumed to be installed on the rooftops of these buildings without parapets. Additionally, the required pumps associated with the moats and lagoons for a number of exhibits will be installed in pits or plant rooms, and due to their 24hour operation, are expected to contribute significantly to noise emissions, notably after hours. Additional noise emissions would be generated from delivery vehicle movements, car park traffic flow and patron voices. Further provision of assumptions is provided within the Noise and Vibration Assessment Report at **Appendix N**.

Additionally, noise emission levels are impacted by meteorological conditions, including wind speed and direction. This will impact on the level of noise coming from the Zoo site during operation.

Noise levels from the Zoo have been predicted for both the opening hours and after hours' time periods, as outlined in **Table 25** and **Table 26** below. Contour plots are provided in **Figure 21** and **Figure 22** respectively.

Table 25 – Predicted noise levels during opening hours

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level (dBA)		Criterion		Compliance
	Calm Meteorological Conditions	Adverse Meteorological Conditions	Daytime	Evening	
Bungarribee	28	28	51	50	Yes
Eastern Creek	25	29	51	50	Yes
R1	37	40	57	50	Yes
S1	26	30	45	N/A	Yes

Source: Wilkinson Murray (Appendix N)

Table 26 – Predicted noise levels after hours

Receiver	Predicted $L_{Aeq, 15min}$ Noise Level (dBA)		Criterion	Compliance
	Calm Meteorological Conditions	Adverse Meteorological Conditions	Night Time	
Bungarribee	<25	<25	40	Yes
Eastern Creek	<25	<25	40	Yes
R1	<25	<25	40	Yes
S1	<25	<25	N/A	Yes

Source: Wilkinson Murray (Appendix N)

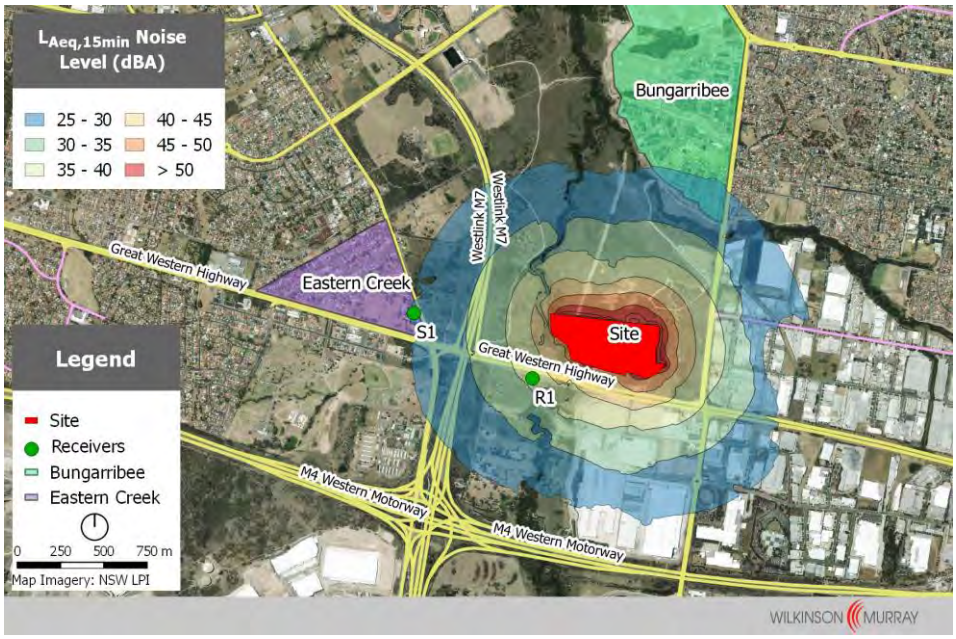


Figure 21 – Noise level contours (calm metrological conditions)
Source: Wilkinson Murray (Appendix N)

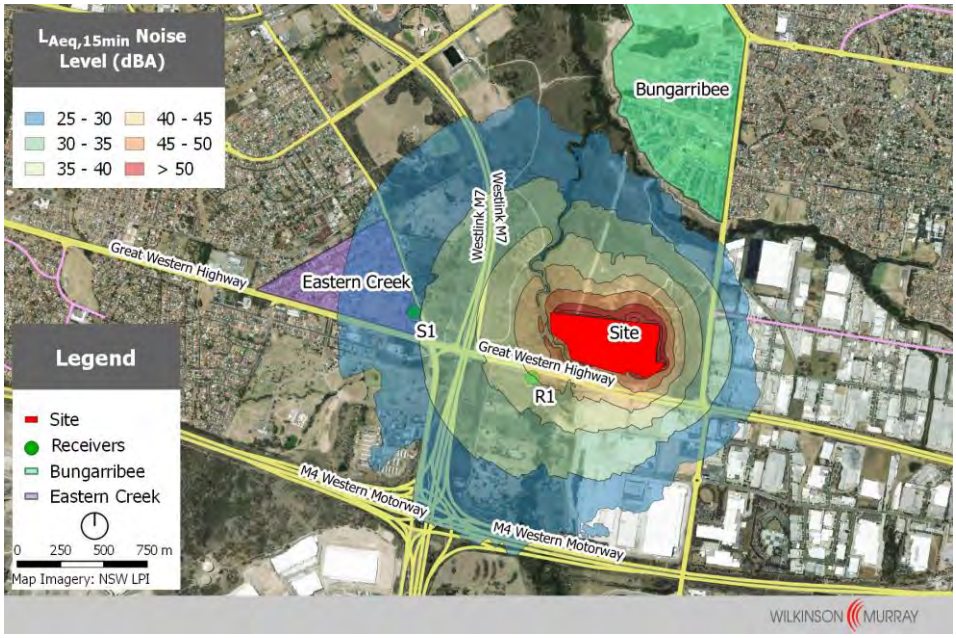


Figure 22 – Noise level contours (adverse metrological conditions)
Source: Wilkinson Murray (Appendix N)

As identified, the predicted operational noise levels of the proposed Zoo at nearby sensitive receivers comply with the relevant criteria as described in **Section 6.2.1** at all times.

In accordance with the INP, an assessment of cumulative noise requires that the $L_{Aeq,\ period}$ noise levels from the development be added to the existing levels of industrial noise at sensitive receivers and be assessed against the applicable amenity criteria. **Table 27** identifies a conservative cumulative assessment for the project.

Table 27 – Cumulative industrial noise levels

Receiver	Time	$L_{Aeq, period}$ Noise Levels			Criterion	Compliance
		Existing	From Project	Cumulative		
Bungarribee	Day	40	28	40	60	Yes
	Evening	40	28	40	50	Yes
	Night	40	25	40	45	Yes
Eastern Creek	Day	35	29	36	60	Yes
	Evening	35	29	36	50	Yes
	Night	35	25	35	45	Yes
R1	Day	40	40	43	60	Yes
	Evening	40	40	43	50	Yes
	Night	40	25	40	45	Yes
S1	Day	35	30	36	45	Yes

Source: Wilkinson Murray (Appendix N)

Sleep Disturbance Impacts

There are certain aspects of the project upon operation which have the potential to cause sleep disturbance, namely roaring lions. Wilkinson Murray have sourced that L_{Amax} noise levels from a roaring lion can reach up to 114dBA at one metre, equating to a L_{Amax} sound power level of 122dBA.

Noise levels at sensitive residential receivers associated with the potential roaring of lions from their enclosures (located in the western half of the Zoo site) have been predicted as per **Table 28** below. This indicates that the roaring of lions is unlikely to disturb sleep as the predicted noise levels comply with the established screening levels.

Table 28 – Predicted noise levels of roaring lions at sensitive receivers

Receiver	Predicted L_{Amax} Noise Level (dBA)		Screening Level	Compliance
	Calm Meteorological Conditions	Adverse Meteorological Conditions		
Bungarribee	33	38	60	Yes
Eastern Creek	38	43	60	Yes
R1	50	54	63	Yes

Source: Wilkinson Murray (Appendix N)

Traffic Noise Impacts

With an increase in traffic movements to and from the site from current conditions during operation of the Zoo, traffic noise in the surrounding area will increase. Those residential receivers likely to be affected by traffic increase are located along the Great Western Highway to the south, between the project site and the M7 Interchange to the west and along Doonside Road to the east. Further information regarding assumptions and the modelling process used is provided in **Appendix N**.

Table 29 – Predicted road traffic noise levels

Road	Without Zoo Day ($L_{Aeq, 15hour}$ dBA)	With Zoo Day ($L_{Aeq, 15hour}$ dBA)	Increase
Great Western Highway	65.3	65.6	0.3
Doonside Road	64.1	64.2	0.1

Source: Wilkinson Murray (Appendix N)

The existing noise levels at the most impacted sensitive receivers along the Great Western Highway and Doonside Road are above the RNP criterion. The addition of the predicted noise impacts from traffic movements associated with the proposed Zoo are well below 2dBA, and therefore in accordance with the RNP no further assessment is required.

Conclusion

The potential noise impacts associated with the proposed Sydney Zoo have been assessed and indicated to comply with all established goals at all nearby sensitive receivers. Additionally, L_{Amax} noise levels due to roaring lions are well below the identified sleep disturbance screening levels. Cumulative noise levels associated with the project and existing industrial sources are predicted to comply at all receivers. With the site being setback substantially to nearby receivers, any ground vibrations stemming from construction activities are expected to be unnoticeable in those areas and therefore significantly below the relevant guideline criteria for human comfort and structural damage.

6.2.4 Mitigation Measures

The safeguards and management measures that would be implemented to address the potential noise and vibration impacts are outlined in **Table 30** below.

Table 30 – Noise and vibration safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
The potential for exceedance of the NMLs across the proposal footprint	Prepare a construction noise and vibration management plan (CNVMP). It would be a sub-plan of the CEMP. As a minimum, the plan would: ▪ Map the sensitive receiver locations including residential properties ▪ Include safeguards and management measures to manage out of hours working ▪ Include a assessment to determine potential risk for activities likely to affect receivers, including for activities undertaken during and outside of standard working hours ▪ Include a process for assessing the performance of the implemented safeguards and management measures ▪ Specify the equipment restrictions that would be implemented at night if night works required ▪ Describe the respite periods that would be implemented ▪ Specify restrictions on allowing equipment, plant and traffic to idle on site ▪ Specify the avoidance of activities that would generate impulsive noise ▪ Ensure any potentially impacted receivers are informed ahead of any planned works taking place outside of the recommended standard hours for construction works ▪ Ensure noise at sensitive receivers is monitored ▪ Identify how the construction staging and program includes for monitoring at sensitive receivers ▪ Include a specific process for	Construction contractor	Pre-construction

Impact	Environmental Safeguard	Responsibility	Timing
	documenting and resolving issues and complaints. *Note: The CNVMP would be routinely updated in response to any changes in noise and vibration. Tool box talks would be used to communicate constructor obligations and responsibilities under the plan.*		
The potential for exceedance of the NMLs across the proposal footprint	Locate fixed plant as far from residences as possible and behind site structures	Construction contractors	Construction
Construction noise impacts	Working hours are to be restricted in accordance with the EPA Interim Construction Noise Guideline. Working hours are to be in accordance with: ▪ Between 7.00am and 6.00pm, Monday to Friday. ▪ Between 8.00am and 1.00pm Saturdays. ▪ No work or deliveries on Sunday and/or public holidays. If work is required to be undertaken outside normal work hours, the Contractor will need approval from the Principal. The Contractor is to provide enough information for the Principal to evaluate any potential noise impact from the proposed works.	Construction contractor	Construction
Construction noise impacts	Community and business notification would be done prior to works commencing outlining the nature of the works, work hours and contact number. Additional community and business notification would be done at least five days before works outside standard hours that has a potential to cause any noise impact.	Construction contractor / Sydney Zoo	Pre-construction/ construction
Construction noise impacts	Any required night time work predicted to exceed the noise management level should aim to not affect residences for more than two consecutive nights or where possible, more than six nights over a one month period.	Construction contractor / Sydney Zoo	Construction

6.3 Traffic, Parking and Access

A Traffic Impact Assessment has been prepared by GTA Consultants and is included at **Appendix E**. A summary of the assessment and proposed mitigation measures are provided below.

6.3.1 Existing Environment

The site is afforded access via the Parklands Access Road off the Great Western Highway, classified as a State Road (HW5) which runs in an east-west direction along the southern boundary. At the existing Parklands Access Road intersection the Great Western Highway is a six lane dual carriageway, with this decreasing to two lanes each way when moving east and west of the site. A speed limit of 80km/h applies at this location. To the east of the site is Doonside Road, a Regional Road with a four lane dual carriageway. Aligned in a north-south configuration, Doonside Road has a 70km/h speed limit. Rudders Street is directly south of the existing Parklands access intersection, and provides access into the Bungarribee Industrial Estate.

The M7 Motorway does not provide a southbound exit ramp onto the Great Western Highway to the west of the site. Southbound vehicles generally need to exit 2.5km further south along the M7 Motorway at Wallgrove Road.

There is currently no publically accessible car parking near to the site. There are approximately 160 spaces proposed as part of the wider Bungarribee Precinct works. The nearest public transport offerings are the bus stops to the east of Rudders Street, however no bus stop facilities are provided. The site is located between Rooty Hill (2.7 km north-west) and Doonside (3 km north) Railway Stations on the T1 Western Line. Blacktown Railway Station is the nearest transport interchange.

There is minimal pedestrian connectivity to the site, due to its location in an area generally characterised by open space and industrial uses. No footpaths are provided along the Great Western Highway or Doonside Road near to the access road. There is an existing separated cycleway which runs parallel to the M7 Motorway.

Existing Intersection Performance

The existing intersection of the Great Western Highway, Rudders Street and the Parklands Access Road was assessed using the SIDRA modelling package (**Table 31**), and indicates a generally good level of service, with minor queuing during the AM and PM peak periods, as outlined in **Table 32** below. Full details are provided in **Appendix E**.

It is noted that the intersection currently operates as a T-intersection with authorised access to the Parkland Access Road only. Generally, priority is given to traffic on the Great Western Highway, resulting in delays for the side roads (Rudders Street and the Parklands Access Road).

Table 31 – SIDRA Level of Service Criteria

Level of Service (LoS)	Average Delay per Vehicle (secs/veh)	Traffic Signals/Roundabout	Give Way and Stop Sign
A	Less than 14	Good operation	Good operation
B	15-28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29-42	Satisfactory	Satisfactory, but accident study required
D	43-56	Near capacity	Near capacity, accident study required
E	57-70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Source: GTA Consultants (Appendix E)

Table 32 – Existing Operating Conditions

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (seconds)	95th Percentile Queue (m)	Level of Service (LoS)
Great Western Highway/Rudders Street/Parkland Access Road	AM	North	0.06	66	7	E
		South	0.32	2	6	A
		East	0.34	57	25	E
		West	0.61	2	22	A
		All	**0.61**	**3**	**25**	**A**
	PM	North	0.02	66	2	E

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (seconds)	95th Percentile Queue (m)	Level of Service (LoS)
		South	0.67	1	23	A
		East	0.52	63	36	E
		West	0.22	3	11	A
		All	**0.67**	**4**	**36**	**A**
	Saturday	North	0.02	63	2	E
		South	0.28	1	5	A
		East	0.05	63	3	E
		West	0.19	1	4	A
		All	**0.28**	**2**	**5**	**A**

Source: GTA Consultants (Appendix E)

Based on the above, the intersection currently operates at a LOS of A, with an average delay of 4 seconds and a degree of saturation (capacity) of up to 0.67 (DOS). However, the SIDRA modelling indicates that the northern and southern approaches operate at LOS E during all three peak periods, a consequence of the average delays in excess of 60 seconds.

For a signalised intersection, the overall intersection LOS is reflective of the intersection operation rather than the individual legs, as signalised intersections optimise to minimise the average delay for the whole intersection. In this case, the intersection runs with a cycle time of 140 seconds, with a significant portion of green traffic light time is dedicated to managing the high traffic volumes through the eastern and western approaches of the Great Western Highway to accommodate the high traffic volumes. This results in an average delay for vehicles on the northern and southern intersection approaches being in excess of 60 seconds, providing a LOS E rating on these approaches.

There is spare capacity within the east and west approaches that could be allocated to the north and south approaches to accommodate additional traffic volumes as the intersection as a whole operates with a LOS A.

6.3.2 Potential Impacts

Anticipated Visitation Assumptions

The Zoo is anticipated to have annual visitation of between 500,000 to 800,000 visitors (refer to **Table 33**), with daily visitation varying across the year due to a variety of factors. These variations have been outlined in three visitation scenarios:

- Peak period: mid/late December to late January (summer school holiday period) and including public holidays;
- Shoulder period: beginning of November to mid/late December and late January to end of February and including all other school holidays; and
- Off-peak period: beginning of March to end of October (excluding school holidays).

Table 33 – Sydney Zoo Daily Visitation Profile

Period	Day	Approximate % of Year	Minimum Daily Visitation	Maximum Daily Visitation	Estimated % of Peak
Peak	Weekday	5%	3,400	5,500	100%
	Weekend and Public Holiday	5%	6,000	8,000	
Shoulder	Weekday	15%	1,400	2,300	40-45%
	Weekend	5%	2,500	3,300	

Period	Day	Approximate % of Year	Minimum Daily Visitation	Maximum Daily Visitation	Estimated % of Peak
Off Peak	Weekday	50%	900	1,450	25-30%
	Weekend	20%	1,575	2,100	

Source: GTA Consultants (Appendix E)

A maximum daily attendance of 8,000 visitors is expected during the peak summer school holiday period. These visitation rates are considered to be similar to that of Scenic World located in the Blue Mountains. Arrival and departure timeframes will also vary depending on the peak period. Further details are provided in **Appendix N**.

Car Parking Requirements

Based on the anticipated visitation to the Zoo and noting the variations in peak period attendance numbers throughout the year, the following assumptions have been created to determine the level of car parking required on-site:

- 60% of visiting families would have two parents, and 40% would have one; and
- An average of 2 children per vehicle.

Based on these assumptions it is estimated that the average vehicle occupancy would be 3.6 people per vehicle for families visiting the Zoo (**Table 34**). For the assessment herein, a conservative estimate of 3 people per vehicle has been assumed.

Table 34 – Vehicle occupancy estimate

Visitor Group	Anticipated Visitor Composition	Average People per Vehicle
Families	85%	3.6
Couples	12.5%	2.0
Singles	2.5%	1.0
Overall average people per vehicle		3.34

Source: GTA Consultants (Appendix E)

Furthermore a mode share of 85% (75% on peak days) vehicle, and 15% (25% on peak days) public transport, walking or cycling has been adopted. Further details on visitor parking demand profiles is provided in **Appendix N**, and based on these assumptions, and the arrival and departure times, the anticipated demand for parking is summarised in **Table 35**.

Table 35 – Visitor Parking Demand

Period	Estimated Parking Demand	
	Weekday	Weekend
Peak	950	1,350
Shoulder	450	650
Off-peak	300	400

Source: GTA Consultants (Appendix E)

Approximately 50 staff members are expected to be on-site at any one time, increasing to between 80 and 110 during the peak patronage periods. Assuming each staff member drove a private vehicle, an approximation of 50 vehicles during the shoulder period can be assumed. Staff would be encouraged to car pool and utilise public transport, notably during weekends and peak periods.

The Zoo proposes a total of approximately 1,324 car spaces with 484 of these to be permanent hardstand car parking spaces (inclusive of the nine proposed accessible spaces). It is therefore considered that the formal car parking supply would be capable of accommodating the weekday parking demand. The overflow car park (of 840 spaces) would be required on weekends during the shoulder and peak periods. The parking demand assessment within **Appendix E** assumes the maximum visitation for each period of the year.

Parking demand would exceed supply only on peak days (public holidays and summer holiday weekends), approximately 5% of the year, with a shortfall of 26 parking spaces. Temporary overflow parking will be negotiated with the WSPT if required, and public transport promotion would be implemented to account for that need.

Accessible Parking

The proposal seeks to provide nine accessible parking spaces (in addition to the 475 formal parking spaces), in accordance with the required rates under the Building Code of Australia, which requires one accessible space for every 50 spaces up to 1,000, and then one accessible space for every additional 1,000 parking spaces.

Bus Parking

Unmarked parallel bus parking is proposed, with capacity for five coaches or up to eight minibuses. An additional six minibus spaces are proposed in the south-eastern corner of the car park.

Bicycle and Pedestrian Access

The Zoo proposes a high level of pedestrian accessibility through the connection of footpaths and crossings within the car park to the wider Western Sydney Parklands Area. Up to 20 spaces for bicycles will be provided near the main entrance for use by visitors and staff. Demand for bicycle spaces will be monitored and adjusted accordingly during the operation of the Zoo.

Traffic Generation

As outlined above and in the Traffic Impact Assessment at **Appendix E**, there are anticipated variations in attendance across the year, including peak, shoulder and off-peak periods. The anticipated traffic generation during the network peak period is summarised in **Table 36** below, assuming a vehicle occupancy rate of 3 people per vehicle, and an 85% vehicle and 15% public transport mode share, and allows for an additional 5% to account for shuttle bus, coach or minibus movements. Additional staff vehicle movements have been included in the below and are expected to introduce 50 vehicles before 9.00am and after 6.00pm.

Table 36 – Traffic Generation Summary

Peak Period	Time	Entering Vehicles (veh/hour)	Exiting Vehicles (veh/hour)	Total Traffic Generation
Weekday AM (Network)	8.00am-9.00am	68[1]	0	68
Weekday (Site)	11.00am-12.00am	171	65	236
Weekday PM	4.30-5.30pm	0	44	44
Weekend	11.00am-12.00pm	246	94	340

1. Including staff and visitor arrivals

Source: GTA Consultants (Appendix E)

These vehicle movements have been assumed to come via the following directional distributions:

- North via Westlink M7 Motorway – 20%;

- North via Doonside Road –10%;
- East via Great Western Highway – 35%;
- South via M7 Motorway/ Wallgrove Road – 20%;
- South via Brabham Drive – 5%; and
- West via Great Western Highway – 10%.

Based on these estimated vehicle numbers, the following SIDRA modelling was completed to assess the operation of the existing intersection at the Great Western Highway/Rudders Street/Parkland Access Road intersection.

Table 37 – Post-Development Operating Conditions

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (seconds)	95th Percentile Queue (m)	Level of Service (LoS)
Great Western Highway/Rudders Street/Parkland Access Road	AM	North	0.04	70	2	E
		South	0.45	4	18	A
		East	0.56	58	26	E
		West	0.62	4	22	A
		All	**0.62**	**4**	**27**	**A**
	PM	North	0.22	50	12	D
		South	0.61	1	10	A
		East	0.63	53	37	D
		West	0.39	25	82	B
		All	**0.63**	**10**	**82**	**A**
	Saturday	North	0.29	48	23	D
		South	0.30	7	48	A
		East	0.04	53	3	D
		West	0.33	19	58	B
		All	**0.30**	**15**	**58**	**B**

The results indicate that the intersection will continue to operate satisfactorily, although queuing will increase slightly on all approaches. This increase is considered to be negligible in terms of the surrounding road network and its capacity.

Modelling was also used to assess the intersection during the Zoo's peak hour generating period (during the shoulder period) to ensure appropriate access arrangements. The peak hour site traffic generation has been superimposed on the AM road network peak hour traffic for a conservative assessment (**Table 38**).

Table 38 – Post-Development Site Peak Hourly Traffic Operating Conditions

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (seconds)	95th Percentile Queue (m)	Level of Service (LoS)
Great Western Highway/Rudders Street/Parkland Access Road	11.00am-12.00pm	North	0.42	40	47	C
		South	0.42	11	100	A
		East	0.02	46	3	D
		West	0.42	36	99	C
		All	**0.42**	**25**	**100**	**B**

The results indicate that the intersection which will provide access to the Zoo site will operate satisfactorily with no physical changes required. The existing turn bays and internal queuing storage are suitable for the shoulder period traffic generation. It is not considered suitable to assess the Zoo's potential traffic

generation during its peak operating period, as this would occur infrequently throughout the year, and at times when typical traffic on the Great Western Highway would be reduced (during school holidays).

Future Surrounding Land Uses

As discussed earlier, the WSPT as part of the Western Sydney Parklands Plan of Management is seeking to develop the Bungarribee Super Park precinct, which would potentially include commercial properties fronting the Great Western Highway.

Currently there are no details around the likely land uses or form of those future developments, and as such a cumulative assessment of the impacts of the fully developed area cannot be completed. An assessment will need to be completed on behalf of any proponent of any new development on those adjacent sites, factoring in the existing Sydney Zoo traffic volumes. This approach has been agreed with the WSPT.

6.3.3 Mitigation Measures

Construction Traffic Impacts

A construction traffic management plan will be prepared to deal with impacts from construction vehicles on the road network. However, given the site's location adjacent to a major road, it is considered that construction activities will have minimal impact on surrounding roads.

Operational Traffic Management

An operational traffic management plan will be prepared prior to the opening of the Zoo. This would outline requirements for shuttle bus services and overflow car parking. Additionally, an initial open period management plan would be prepared and consider the peak opening period in comparison to the general operation of the site.

Table 39 – Traffic, parking and access safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Construction traffic impacts	A construction traffic management plan (CTMP) would be prepared as a sub-plan of the CEMP. As a minimum, the plan would include the following controls: ▪ minimise use of heavy vehicles on local roads ▪ restrict deliveries to outside of peak traffic periods where possible ▪ ensure emergency vehicle access is maintained, including consultation with ▪ emergency services ▪ identify haulage routes and minimise impacts on local routes ▪ provide warning and advisory signage ▪ providing safe access points to work areas from the adjacent road network ▪ safety barriers where necessary ▪ maintaining adequate sight distance ▪ displaying prominent warning signage ▪ covering truck loads ▪ avoiding vehicle idling ▪ deliveries planned to minimise the number of trucks arriving at site at one time.	Construction contractor	Pre-construction/ Construction

Impact	Environmental Safeguard	Responsibility	Timing
	▪ materials delivered and spoil removed from the site during standard construction hours. ▪ use of Traffic Controllers to ensure safe vehicle and pedestrian movements for example when trucks enter or leave the site ▪ a Driver Code of Conduct plan ▪ Provide for local community consultation and notification of local road network and traffic impacts		
Operational traffic impacts	An operational transport management plan (OTMP) would be prepared which would investigate the potential of the following: ▪ online booking systems, with allocated visiting periods and staggered timing ▪ off-peak ticketing price reductions ▪ promotion of access via the M7 Motorway ▪ promotion of arrivals via public transport ▪ promotion of car pooling ▪ combined tour packages with other tourist destinations ▪ potential for additional regular route bus services and direct shuttle bus services between Blacktown Railway Station and the site (subject to further consultation with TfNSW) ▪ promotion of school tours during off-peak periods ▪ preparation of a Work Place Travel Plan to minimise staff travel by private car ▪ preparation of a Transport Access Guide for visitors ▪ extended opening hours, particularly during peak periods to flatten out the peak	Sydney Zoo	Operation
Initial opening traffic impacts	An initial opening period transport management plan will be prepared with considering for the peak opening period and specific opening events which would be expected to have different traffic generating impacts compared to normal operation.	Sydney Zoo	Operation

6.4 Water, Drainage and Stormwater

This section summarises the Stormwater Management Plan Report prepared by Lindsay Dynan at **Appendix G**. The Stormwater Management Plan for the Zoo has been designed primarily on the requirements of Blacktown City Council's Development Control Plan and associated guidelines, as those controls were considered to generally encompass requirements of other authorities as outlined within the SEARs. Refer to **Appendix** F for civil and stormwater plans and **Appendix G** for specifications stemming from the guidelines.

6.4.1 Stormwater Management

The site encompasses the ridgeline of a minor hill, with slopes falling away in all directions, and existing grades across the site being in the range of 3-5%. As described in **Section 6.10** the site is generally comprised of grassland with patches of native vegetation. Runoff from the site has been modelled based on these

conditions, with the site split into four separate quadrants to account for the ridgeline. These quadrants have been used to model the post-developed site also.

A brief description of the proposed development in each quadrant is provided below:

- Area 1 - North-West (NW): Development generally comprising the zoo, including exhibits, footpaths, public spaces, roads, buildings and open basins;
- Area 2 - South-West (SW): Development generally comprising the main carpark (in part) consisting of a sealed asphalt surface, overflow carpark consisting of an unsealed gravel surface and areas of existing Cumberland Plain Woodland to remain;
- Area 3 - North-East (NE): Development generally comprising the zoo, including exhibits, footpaths, public spaces, roads and buildings; and
- Area 4 - South-East (SE): Development generally comprising the main carpark (in part) and site entry road, consisting of a sealed asphalt surface.

Stormwater Management Philosophy

The Zoo site will be broken up into sub-catchments for the purpose of stormwater management, each of which incorporates grassy buffers/swales as primary treatment of stormwater pollutants, with runoff from each of the sub-catchments directed to bioretention basins for secondary treatment. Runoff from new roof catchments within the Zoo footprint will be collected and diverted directly to the pit and pipe subsurface network connecting the bioretention basins, and onward to the stormwater harvesting storage areas.

Runoff from the carpark catchments will be conveyed via sheet flow to various stormwater inlet pits and collected by a pit and pipe network, before diverting to a proprietary gross pollutant trap for secondary treatment and then directed to the stormwater harvesting storage areas.

Harvested Stormwater

Harvested stormwater will be generally collected at two locations being a large open water storage basin at the western end of the Zoo, and a small underground storage chamber in the north-east corner. The harvested stormwater will be pumped on demand from both locations to the holding basin adjacent the restaurant building. Stormwater re-use demands for the site (irrigation, top-up of wet moats, greywater for toilet flushing and hose down areas) will be drawn via a pump from the holding basin. Greywater demand and moat top up will receive additional treatment via proprietary mechanical filtration and UV disinfection prior to reticulation through the site.

Stormwater Harvesting

As per the relevant requirements of the Blacktown City Council Development Control Plan (DCP), the proposed development must provide 80% of the non-potable demand using non-potable sources. However, given the unique design and scale of the development, that target is considered unreasonable due to the level of harvested storage that would be required, and as such, an investigation of an optimal re-use efficiency level was undertaken.

This investigation was undertaken using MUSIC modelling, with the rainfall data coming from the Bureau of Meteorology for the last 45 years of daily rainfall from the Quakers Hill Treatment Works monitoring site (6km from the site). The stormwater re-use demands of the site have been calculated as per **Table 40.**

Table 40 – Stormwater re-use demands

Activity	Usage	Usage (L/day)
Irrigation (Tropical)	22.7 L/m^2/week	11,850
Irrigation (Turf)	22.7 L/m^2/week	17,300
Toilet Usage	100 L/day/toilet	5,300
Back of House Hose Down	5mm/m^2/day	5,750
Basin/Moat Evaporation	1500mm/year/m^2	17,150

Source: Lindsay Dynan (Appendix G)

The results as outlined in **Appendix G** indicate that beyond approximately 65% re-use efficiency, diminishing returns could be expected. It was therefore considered that adopting a total stormwater harvesting storage volume of 1,750m^3 will provide an efficient result for the project, while still meeting the water conservation intent established by Blacktown City Council.

This storage will be provided via two storage facilities. The storage basin is located in the north-west corner of the Zoo site, and generally fed from the north-west and south-west catchments, with a capacity of 1,260m^3. The secondary basin, known as the holding basin, is located adjacent to the Boma/Restaurant on the ridgeline of the site. It will be fed by water pumped from the storage basin in the west, and the smaller storage chamber in the east. The holding basin provides a capacity of 840m^3, for a total site capacity of 2,100m^3. The storage chamber in the east will be a temporary storage facility for runoff from the north-east and south-east catchments, with a float switch systematically switching runoff to the holding basin.

Stormwater Quality

Water Sensitive Urban Design must be utilised across the site to achieve a minimum reduction of the post-development average annual load of pollutants, as per the required targets under the Blacktown DCP guidelines as outlined in **Table 41**.

Table 41 – Pollution Reduction Targets

Pollutant	Reduction Target
Gross Pollutants	90 %
Total Suspended Solids	85 %
Total Phosphorous	65 %
Total Nitrogen	45 %
Total Hydrocarbons	90 %

Source: Lindsay Dynan (Appendix G)

The stormwater quality was assessed using the MUSIC modelling software. A model was developed to simulate the conditions which would be expected once the site is fully developed. The model generally covers the following:

- Runoff from the Zoo sub-catchments is treated by primary grassy buffers/swales before being directed to secondary bioretention basins;
- Runoff from new roof catchments, all of which are located within the Zoo, will be collected and diverted (via a first flush device) directly to the pit and pipe subsurface network; and
- Runoff from the carpark sub-catchments will be treated by primary proprietary pit insert before being directed to a secondary proprietary gross pollutant trap.

The results of the MUSIC modelling are provided in **Table 42**.

Table 42 – Pollution reduction results

Pollutant	Sourced	Residual	Reduction	Council Requirements
	kg/yr	kg/yr	%	%
Total Suspended Solids	33,600	3,750	88.8	85
Total Phosphorus	24.3	5.39	77.8	65
Total Nitrogen	141.0	38.9	72.5	45
Gross Pollutants	1,310	0	100	90

Source: Lindsay Dynan (Appendix G)

Based on the MUSIC modelling results as outlined in it has been demonstrated that the treatment train as identified in this report, and the attached model, meets and exceeds Blacktown Council's stormwater pollutant treatment targets.

On-site Detention

There are three on-site detention (OSD) storages proposed across the site. OSD 1 is the primary basin (being an open basin), detaining runoff from the north-west and south-west quadrants (Area 1 and Area 2 as shown in **Table 43**). OSD 2 will detain runoff from the north-east quadrant (Area 3 as shown in **Table 44**) and OSD 3 (Area 4 as shown in **Table 45**) from the south-east quadrant. The latter two basins will be a combination of above and below ground storage systems. The Drains modelling system was used to determine the peak rainfall runoff rates for a variety of annual recurrence interval rainfall events. These runoff rates have been calculated for both pre-and-post-development scenarios to demonstrate the OSD is effective in attenuating peak flows to pre-developed levels across the site.

Table 43 – OSD 1 peak site discharge

North-West and South-West Quadrants		
Contributing Catchment	104,100m^2	
Percentage Impervious	56.7%	
Proposed Storage Volume	2,930m^3	
Proposed Outlet	4/DIA225 piped culverts	
Peak Discharge Rates		
Annual Recurrence Interval	Pre-Developed Peak Discharge (m^3/s)	Post-Developed Peak Discharge (m^3/s)
1	0	0.31
2	0.11	0.35
5	0.46	0.41
10	0.99	0.46
20	1.31	0.78
50	2.10	1.46
100	2.43	1.87

Source: Lindsay Dynan (Appendix G)

Table 44 – OSD 2 peak site discharge

North-East Quadrant		
Contributing Catchment	26,770m^2	
Percentage Impervious	45.3%	
Proposed Storage Volume	800m^3	
Proposed Outlet	1/DIA225 piped culvert	
Peak Discharge Rates		
Annual Recurrence Interval	Pre-Developed Peak Discharge (m^3/s)	Post-Developed Peak Discharge (m^3/s)
1	0	0.11

North-East Quadrant		
2	0.05	0.13
5	0.18	0.18
10	0.39	0.20
20	0.50	0.22
50	0.77	0.24
100	0.90	0.42

Source: Lindsay Dynan (Appendix G)

Table 45 – OSD 3 peak site discharge

South-East Quadrant		
Contributing Catchment	8,680m^2	
Percentage Impervious	83.4%	
Proposed Storage Volume	210m^3	
Proposed Outlet	1/DIA225 piped culvert	
Peak Discharge Rates		
Annual Recurrence Interval	Pre-Developed Peak Discharge (m^3/s)	Post-Developed Peak Discharge (m^3/s)
1	0	0.06
2	0.02	0.07
5	0.07	0.07
10	0.15	0.08
20	0.19	0.08
50	0.29	0.23
100	0.34	0.34

Source: Lindsay Dynan (Appendix G)

The above Drains modelling indicates that the proposed OSD systems sufficiently reduce the peak site discharges to pre-development rates for all design storms, excluding low intensity rainfall events for 1 and 2 year annual recurrence intervals. This is considered to have occurred due to the adoption of the antecedent moisture content value of 2.5 in the Drains modelling. Antecedent moisture content is a measure of the pre-storm soil moisture, and a value of 2.5 is considered conservative. Further modelling was undertaken with this value at 3, which highlighted the effect of antecedent moisture content on peak site discharge. While not specifically meeting the requirements of Blacktown City Council, the design using the Drains analysis which was adopted for the OSD is industry standard and considered appropriate for application for this project. Refer to **Appendix G** for full details on that modelling. Points of discharge for the OSD systems are generally located close to the OSD storages.

6.4.2 Flooding

Flooding information for the site has been provided by Blacktown City Council and has been translated onto the stormwater plans. It indicates that the 1 in 100 year annual recurrence interval flood event impacts the western portion of the site as defined by the boundaries. The extent of proposed development works have been purposefully limited to the line of the 1 in 100 year ARI flood.

6.4.3 Probable Maximum Flood (PMF) Event

Flooding information for the PMF event has also been provided by Blacktown City Council and translated onto the stormwater plans. Designing to avoid development within the PMF flood extent is generally not a consideration in NSW. Nonetheless,

an opportunity was identified whereby buildings and back of house areas could be located such that they were above the PMF level. This has been adopted.

6.4.4 Sediment and Erosion Control

Currently there is no detail available regarding construction sequencing or staging, however it is understood that the natural topography of the site will require erosion control measures to be implemented. In this regard, two sedimentation basins are proposed at this stage, along with perimeter silt fencing and stabilised site access for vehicle movement. Further information will be prepared as part of the design development / construction certificate process.

Bulk Earthworks

The bulk earthworks phase of the project will introduce the greatest risk of erosion and sediment issues. These will arise from activities including site re-grading, excavations for moats and pools within enclosures and the creation of raised service roads and the overflow car park. The levels of cut and fill have been calculated as per **Table 46** below.

Table 46 – Estimated cut and fill volumes

Description	Cut or Fill	Volume
Excavations for moats, ponds and bioretention basins	Cut	12,700m^3
Net earthworks for north west service road and basins	Fill	8,500m^3
Net earthworks for north east service road and basins	Fill	2,500m^3
Net earthworks for overflow carpark	Fill	15,500m^3
Total	Fill	13,600m^3

Source: Lindsay Dynan (Appendix G)

Due to the level of earthworks required, particularly during the construction of the OSD basins and exhibits requiring moats, a large quantity of fill (13,600m^3) will be required to be imported to the site. It is expected the imported fill will be a more economical solution than if the site regrading adopted a typical cut/fill balance approach. The expected access to inexpensive clean fill is due to the large infrastructure works that will be occurring in the Sydney metropolitan area during the period the Zoo will be constructed.

6.4.5 Mitigation Measures

A number of water, drainage and stormwater mitigation measures and safeguards have been identified to address the impacts of the proposal during construction and operation.

Table 47 – Water, drainage and stormwater safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Sediment-laden run off and associated water quality impacts management	Prepare a Soil and Water Management Plan as part of the CEMP and address the following: ▪ The NSW Soils and Construction – Managing Urban Stormwater Volume 1 'the Blue Book' (Landcom, 2004) and Volume 2 (DECC, 2008) Detail the following as a minimum: ▪ Identification of catchment and sub-catchment areas, high risk areas and	Construction contractor	Pre-construction/ construction

Impact	Environmental Safeguard	Responsibility	Timing
	sensitive areas ▪ Sizing of each of the above areas and catchment ▪ The likely volume of run-off from each road sub-catchment ▪ Direction of flow of on-site and off-site water ▪ Separation of on-site and off-site water ▪ The direction of run-off and drainage points during each stage of construction ▪ Dewatering plan which includes process for monitoring, flocculating and dewatering water from site (i.e. formation or excavations) ▪ A mapped plan identifying the above ▪ Include progressive site specific Erosion and Sedimentation Control Plans (ESCPs). The ESCP is to be updated at least fortnightly ▪ A process to routinely monitor the Bureau of Meteorology weather forecast ▪ Preparation of a wet weather (rain event) plan which includes a process for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather. These controls are to be shown on the ESCPs ▪ Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.		
On-site sediment and waste laden run off and associated water quality impacts during construction	▪ Erosion and sediment control measures would be implemented to ensure no sediment leaves the site. ▪ All waste materials (such as demolition materials) would be contained to prevent possible run off prior to removal from the site.	Construction contractor	Construction
Accidental spillage and associated water quality impacts	▪ Maintain emergency spill kits on-site at all times and make all staff aware of the location of the spill kits and trained in their use.	Construction contractor	Construction
Fuel storage and refuelling	▪ All fuels, chemicals, and liquids would be in an impervious bunded area within the compound site. ▪ The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas within the compound site.	Construction contractor	Construction
Machinery maintenance checks	▪ Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery.	Construction contractor	Construction
Erosion risk	▪ Disturbed surfaces would be reinstated as soon as possible. ▪ Erosion and sedimentation control measures would not be removed until disturbed areas have stabilised. ▪ Any damage from construction to the ground surface shall be restored to pre-construction condition on completion of works.	Construction contractor	Construction

6.5 Aboriginal Heritage

The subject site is located within a larger area known as the Cumberland Plain which is home to the Darug language group (Dharruk – alternate spelling), as identified within the Aboriginal Archaeological Survey Assessment (AASA) at **Appendix M**, through a number of different clan groups. The Darug language group is believed to have encompassed the area from Appin to the Hawkesbury River, and from west of the Georges River to Berowra Creek.

6.5.1 Aboriginal Community Consultation

As part of the preparation of the AASA, Artefact consulted with a number of Aboriginal stakeholders during the heritage assessment process. These included the Deerubbin Local Aboriginal Land Council, The National Native Title Tribunal and the Aboriginal Heritage Department of the OEH. Additionally, letters were sent out to forty-five Aboriginal persons or organisations identified, including:

- Darug Land Observations;
- Darug Consultants and Archaeological Assessments;
- Walbunja;
- Badu CHTS;
- Dharug;
- Eora;
- Gangangarra;
- Ngarigo;
- Nundagurri;
- Walgalu; and
- Wandandian.

A full list of Aboriginal stakeholders consulted is provided in the AASA at **Appendix M**.

6.5.2 Previous Archaeological Studies

There have been a number of previous archaeological investigations conducted within the wider Bungarribee Precinct:

- Jim Kohen PhD Research in 1984;
- Blacktown City Council in 1986 (by Jim Kohen); and
- JMcD CHM in 2006, 2007 and 2011.

There have been a further five smaller investigations undertaken within the wider Parkland area. These investigations generally agree that the majority of the wider Bungarribee Parklands area has moderate to good archaeological potential, and in particular the Zoo site is identified by a previous Artefact investigation (2014) as being within the refined WS Potential Archaeological Deposit (PAD) 1 area (previously known as a wider PAD WSP1 area under the JmcD CHM 2006 investigations). Salvage excavations identified generally low density stone artefacts, with a total of 346 artefacts being recovered. No previous archaeological excavations have occurred within the Zoo site.

6.5.3 Existing Environment

Online searches identified three Aboriginal sites within the Zoo area which have been recorded on the Aboriginal Heritage Information Management Sydney (AHIMS):

- Bungarribee 10 Blacktown #45-5-0455:
  - An artefact scatter located about 200 metres along a road, recorded in 1984 as being a chert point, chert flake and a silcrete flake
- Bungarribee 18 Blacktown #45-5-0465:
  - An artefact scatter located in an artificial drainage ditch, recorded as three silcrete artefacts and a utilised slab of local igneous rock, in a highly disturbed context
- BP-AS-6 #45-5-4433:
  - An artefact scatter located in a mid-slope area of rolling hills and grasslands.

A site survey was undertaken by Artefact on 3 August 2015, with the three survey units being defined by natural landforms within the study area. Due to poor visibility of the study area, this survey targeted key areas of exposure including existing tracks, tree bases and the creek line. An estimated 0.5% of each survey unit was effectively surveyed using this method. This survey was completed by foot, with aerial photography and topographic maps carried by the survey team, with GPS tracking used to determine the location of any Aboriginal sites and landscape features.

The survey managed to identify two specified areas of PAD (refer to **Figure 23**) contained within the general WS PAD1 area, and the three recorded AHIMS sites were inspected. No artefacts were discovered at any of those three sites.

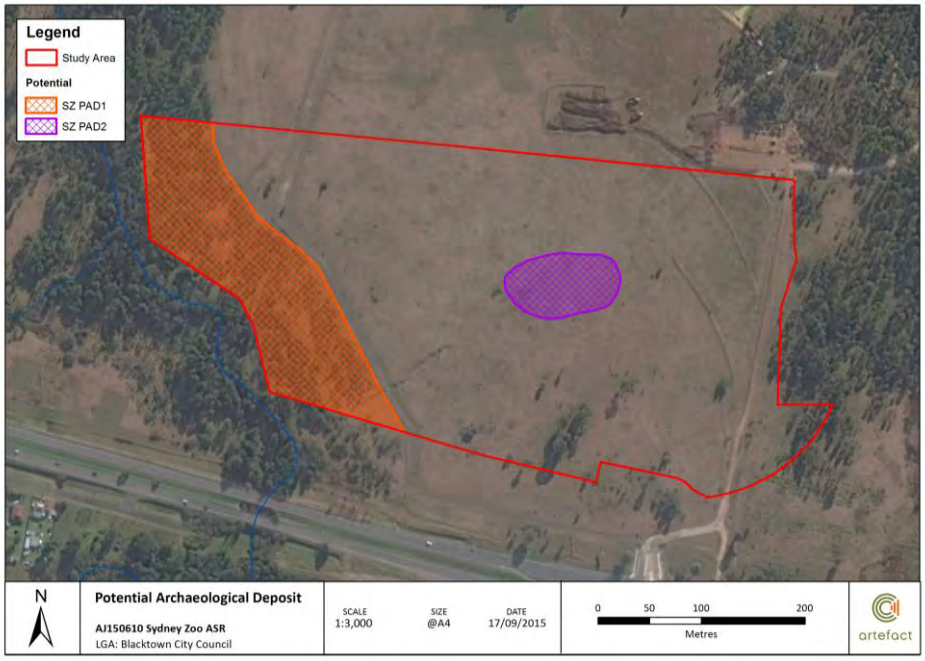


Figure 23 – Two identified PAD sites are located within the Zoo footprint
Source: Artefact (Appendix M)

The two PAD sites are located within the flat area adjacent to Eastern Creek (SZ PAD1) and the crested area approximately 275m east of the creek line (SZ PAD2).

Archaeological significance assessment of the five recognised areas of Aboriginal heritage is summarised in **Table 48** below.

Table 48 – Archaeological Significance Assessment

Site Name	Research Potential	Scientific/Archaeological Value	Representative Value	Rarity Value	Overall Significance
45-5-0455	Low	Low	Moderate	Low	Low
45-5-0465	Low	Low	Moderate	Low	Low
45-5-4433	Low	Low	Moderate	Low	Low
SZ PAD1*	Moderate	Moderate	Low/Moderate	Low/Moderate	Moderate
SZ PAD2	Unknown	Unknown	Unknown	Unknown	Unknown

* = likely significance based on the results of salvage excavation at Bungarribee North by Artefact (2015)
Source: Artefact (Appendix M)

Those sites identified as having low archaeological significance have been classified as impacted or associated with disturbance. These sites do not represent research potential or archaeological value. SZ PAD 1 is recorded as likely to have a moderate archaeological significance due to similar landforms and structures as a previously salvage excavation site at Bungarribee North (completed by Artefact in 2015). This salvage confirmed the research potential of the Eastern Creek floodplain area, and its surrounding landforms, and therefore the SZ PAD1 site can be assumed to demonstrate low to moderate representative, rarity and education values.

SZ PAD 2 is located in an area with limited surface visibility, which resulted in any artefacts that may have been present during the survey going undetected. With the PAD being located in a crested landform area, the type of which have not previously been explored within the Bungarribee Precinct, the archaeological significance or nature of the SZ PAD 2 site cannot be accurately assessed. Further investigations would be required to determine the values applied to the site. For further details refer to the AASA at **Appendix M**.

6.5.4 Potential Impacts

The AHA provides a summary of impacts to the identified Aboriginal objects and the two PAD areas, with all but SZ PAD1 having a total loss of value resulting from the construction and operation works. SZ PAD1 will be impacted by approximately 0.4ha, from the extension of the overflow car park into the area.

Table 49 – Summary of impacts to identified Aboriginal items and PAD areas

Site number	Impact	Type of Harm	Degree of harm	Consequence
45-5-0455	Impacted by exhibit space	Direct	Total	Total loss of value
45-5-0465	Impacted by car park works	Direct	Total	Total loss of value
45-5-4433	Impacted by exhibit space	Direct	Total	Total loss of value
SZ PAD1	0.4ha impacted by overflow car park	Direct	Partial	Partial loss of value
SZ PAD2	Impacted by exhibit space and back of house buildings	Direct	Total	Total loss of value

Source: Artefact (Appendix M)

6.5.5 Mitigation Measures

Generally, the AASA recommends that:

- No further investigation of the three AHIMS site is required;
- Archaeological salvage excavation in SZ PAD1 is not required as the likely significance has been determined based on similar landform sites previously investigated; and
- Archaeological salvage excavation is required at SZ PAD2 in accordance with the OEH code of practice.

When excavation of SZ PAD2 has been completed an Aboriginal Cultural Heritage Assessment Report would be prepared, which would outline consultation results with Aboriginal stakeholders, an assessment of cultural significance and management measures for the works. For further details on the recommendations of the AASA refer to **Appendix M**.

Table 50 – Aboriginal heritage safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Potential heritage and archaeological impacts - general	Develop an Aboriginal Cultural Heritage Assessment Report (ACHAR). It would be within the CEMP. As a minimum, the plan would: ▪ map locations of known and potential sites of heritage and archaeological value do ▪ identify high-risk and no-go zones ▪ identify potential environmental risks and impacts due to the proposed work ▪ identify appropriate safeguards and management measures to minimise potential risk ▪ identify appropriate safeguards and management measures to avoid the risk of harm ▪ implement appropriate safeguards and management measures to protect heritage items and potential archaeological assets	Construction contractor	Pre-construction
Heritage induction training to cover all works across the site	▪ Provide Aboriginal heritage awareness training to the construction workforce prior to starting on site which would include: – guidelines to follow if unanticipated heritage items or deposits are located during works – the procedure for managing any unexpected find, discovering human remains, or unearthing other archaeological remains. ▪ Provide the Aboriginal heritage awareness training to any person or visitor to the site during construction	Construction contractor	Construction
Unexpected finds discovery across the site	▪ If unexpected finds are discovered during the proposed works, immediately cease all works within 10 metres of discovering an unexpected find (e.g. archaeological remains, heritage item, and potential relic). ▪ Engage a heritage consultant to assess the find and the NSW Heritage Division would be notified of the discovery of a relic in accordance with Section 146 of the NSW *Heritage Act 1977*	Construction contractor	Construction
Human remains discovery	Handle human remains under the same	Construction	Construction

Impact	Environmental Safeguard	Responsibility	Timing
across the site	process as an unexpected finds discovery; however, prior to the archaeologist recording the find contact the NSW Police, the OEH environment line and the OEH anthropologist.	contractor	

6.6 Non-Aboriginal Heritage

The Bungarribee Precinct was originally developed as a government farm (known as the Rooty Hill Farm), prior to being part of a land grant for farming and cultivation purposes (the Bungarribee Estate). This estate included a large number of buildings, including the homestead, a large barn, barracks, stables, a blacksmith and a carpenters shop. During World War II, the area was used as a Royal Australian Air Force dispersal area, and includes a sealed landing strip (to the north of the Zoo site), taxiways and aircraft dispersal pads.

The land was resumed by the Overseas Telecommunications Commission (OTC) in 1954, and constructed a transmission station with a series of aerials erected across the land. The OTC station was decommissioned in the 1990s, before being demolished in 2001, with the transmission towers also being removed prior to its demolition. Refer to **Appendix L** for a full description of the history of the site.

6.6.1 Previous Archaeological Studies

Several heritage studies have been conducted within the Bungarribee Precinct since 2000:

- Austral Archaeology (2000): identified structural remains of a former farm and two disused wells, and a brick structure. All items are located outside the Zoo site.
  - Test excavations later revealed the foundations of the Bungarribee Estate, and also a 1900s farm in the north-eastern part of the Precinct.
- GML (2007): prepared a Conservation Management Plan for the Doonside Parcel located north of the Bungarribee Precinct.
  - Test excavations identified the location of two timber outbuildings associated with the Bungarribee Estate, as well as fence lines and drainage channels
- Artefact (2014): identified potential remains of areas such as the Eastern Creek farms and Mansell Farms, located outside the Zoo site.

6.6.2 Existing Environment

A site inspection was conducted on 3 August 2015 of the Zoo site (the study area) on foot, and a photographic record was made. Generally, the site is comprised of cleared fields with a wooded area to the west, adjacent to Eastern Creek. Disturbance is apparent in the area from drainage pipelines and vehicle access tracks. Two concrete footings were identified during the site inspection, which are likely to be associated with the former OTC transmission towers. No other items of heritage or archaeological potential were identified.

6.6.3 Potential Impacts

A series of grading's have been identified to outline which archaeological remains are likely to survive within the Zoo site with these ratings applied to the three main heritage items as described above:

- Low potential: likely to be high impacts in these areas, deeper sub-surface artefacts may survive
- Moderate potential: while there are impacts, a range of archaeological remains are likely to survive including deeper sub-surface artefacts
- High potential: substantially intact archaeological remains could survive in these areas

Table 51 – Existing heritage items within the general area

Heritage Item	Rating	Description
Rooty Hill Government Farm	Nil-Low	There are no records of associated farm structures having been located within the study area
Bungarribee Estate	Nil-Low	The focus of activities fell outside of the Bungarribee Precinct.
OTC Transmission Station and Towers	Nil-Low	The buildings were located approximately 200m north of the study area, and were demolished in 2001. The associated concrete tower footings in the study area no longer present research potential.

Overall, the study area has been assessed as having nil to low potential to contain relics. This is due to the past history of the site, having been used for grazing purposes, and that there is no visible evidence that homesteads were built within the study area of the Zoo. It is known that buildings within the Bungarribee Precinct are situated outside of the Zoo site, and to the south of the Great Western Highway, and are therefore considered unlikely to be impacted by the works. Additionally, the only land use with development present in the study area, the OTC transmission station, no longer provides research potential. A full assessment of significance is provided in **Appendix L**. The proposed Zoo works, including large scale earthworks, will not impact on any identified items of heritage significance, or on any areas likely to contain relics.

6.6.4 Mitigation Measures

The following mitigation measures are proposed within the Statement of Heritage Impact at **Appendix L** to ensure that any items of heritage significance are conserved.

Table 52 – Non-Aboriginal heritage safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Potential heritage and archaeological impacts - general	Develop a non-Aboriginal heritage management plan (NAHMP). It would be a sub-plan of the CEMP. As a minimum, the plan would: ▪ map locations of known and potential sites of heritage and archaeological value do ▪ identify high-risk and no-go zones ▪ identify potential environmental risks and impacts due to the proposed work ▪ identify appropriate safeguards and management measures to minimise potential risk ▪ identify appropriate safeguards and management measures to avoid the risk of harm ▪ implement appropriate safeguards and management measures to protect heritage items and potential archaeological assets	Construction contractor	Pre-construction

Impact	Environmental Safeguard	Responsibility	Timing
Heritage induction training to cover all works across the site	▪ Provide non-Aboriginal heritage awareness training to the construction workforce prior to starting on site which would include: – the location of heritage items outside the study area, including the extant gate entrance for the former OTC transmission station – guidelines to follow if unanticipated heritage items or deposits are located during works – the procedure for managing any unexpected find, discovering human remains, or unearthing other archaeological remains. ▪ Provide the non-Aboriginal heritage awareness training to any person or visitor to the site during construction	Construction contractor	Construction
Unexpected finds discovery across the site	▪ If unexpected archaeological finds are discovered during the proposed works, immediately cease all works within 10 metres of discovering an unexpected find (e.g. archaeological remains, heritage item, and potential relic). ▪ Engage a heritage consultant to assess the find and the NSW Heritage Division would be notified of the discovery of a relic in accordance with Section 146 of the NSW *Heritage Act 1977*	Construction contractor	Construction
Human remains discovery across the site	Handle human remains under the same process as an unexpected finds discovery; however, prior to the archaeologist recording the find contact the NSW Police, the OEH environment line and the OEH anthropologist.	Construction contractor	Construction

6.7 Waste Management

Waste management legislation for NSW identifies waste generation and management, materials reuse and recycling, transport and disposal and outlines a hierarchy for waste minimisation. The hierarchy advocates:

- Avoidance, in preference to
- Recovery, including reuse, recycling, reprocessing and energy recovery, in preference to
- Responsible disposal.

Where disposal remains the only option, the Waste Classification Guidelines 2009 provide for classifying six types of waste: special, liquid, hazardous, restricted solid waste, general solid (putrescible) and general solid (non-putrescible). The classifications determine how the materials are to be stored, transported, management and disposed of.

Further explanation of the waste management hierarchy and the applicable waste management legislation is provided in the Waste Management Plan prepared by SLR Consulting at **Appendix Q**.

6.7.1 Potential Impacts

Construction

Waste would be generated from a number of activities, generally grouped into the following broad waste streams:

- Excavation material including sandstone, rock and soil;
- Green waste;
- Construction wastes including offcuts;
- Plant maintenance waste;
- Packaging waste;
- Work compound (construction worker) waste; and
- Waste water.

Potential waste types with their classification are provided in **Table 53**.

Table 53 – Potential construction waste generation classifications

Waste Types	NSW Classification	Proposed Reuse / Recycling / Disposal Method
Site Preparatory / Construction		
Green waste	General solid (non-putrescible) waste	Reuse / recycling on-site or off-site recycling
Excavated material (virgin extracted natural material, EMN)	General solid (non-putrescible) waste	Reuse on-site where possible or reuse for similar projects. Sandstone may be incorporated in design or sold.
Sediment fencing, geotextile materials	General solid (non-putrescible) waste	Reuse at other sites where possible or disposal to landfill
Concrete (solids and washouts) and asphalt	General solid (non-putrescible) waste	Reuse on-site where possible or recycled off-site
Steel reinforcing, other metal (e.g. wire mesh), bulk electrical cabling, mesh	General solid (non-putrescible) waste	Off-site recycling
Conduits and pipes	General solid (non-putrescible) waste	Off-site recycling
Timber formwork / bamboo	General solid (non-putrescible) waste	Reuse on-site or off-site recycling
Cross laminated timber	General solid (non-putrescible) waste	Reuse on-site or disposal to landfill
Plasterboard	General solid (non-putrescible) waste	Off-site recycling or disposal to landfill
Bricks, tiles	General solid (non-putrescible) waste	Off-site recycling
Glass	General solid (non-putrescible) waste	Off-site recycling
Light bulbs	Hazardous waste	Off-site recycling
Plant Maintenance		
Tyres	Special waste	Off-site recycling or disposal
Empty oil and other drums / tins (e.g. fuel, chemicals, paints, spill clean ups)	Hazardous waste if the containers were previously used to store Dangerous Goods (Class 1, 3, 4, 5 or 8) and from which residues have not been removed. General solid (non-putrescible) waste if cleaned by triple washing or vacuuming.	Transport to comply with the transport of Dangerous Goods Code applies in preparation for off-site recycling or disposal at licensed facility. (Note: Discharge to sewer subject to Trade Waste Agreement with Sydney Water)
Batteries	Hazardous waste	Off-site recycling
Packaging		
Packaging materials, including wood, plastic	General solid (non-putrescible) waste	Off-site recycling

Waste Types	NSW Classification	Proposed Reuse / Recycling / Disposal Method
(including stretch wrap or LLPE), cardboard and metals		
Wooden crates	General solid (non-putrescible) waste	Reused for similar projects, returned to suppliers, or off-site recycling
Work Compound and Associated Offices		
Recyclable beverage containers	General solid (non-putrescible) waste	Co-mingled recycling at off-site licensed facility
Clean paper and cardboard	General solid (non-putrescible) waste	Paper and cardboard recycling at off-site licensed facility
General domestic waste generated by workers (soiled paper and cardboard, food stuffs, polystyrene)	General solid (non-putrescible) waste mixed with putrescible waste	Recovery at a suitable treatment facility or disposal at landfill
Pump-out waste and septage (sewage)	Liquid (trade) waste	Off-site disposal at licensed facility or disposal direct to sewer where arranged with Sydney Water.

Source: SLR Consulting (Appendix Q)

Waste generation rates can be assumed through adoption of composition and conversion factors from the UK WRAP (2014), due to no suitable Australian references. Conservative estimates have been assumed where indicative waste compositions were not available. Refer to **Appendix Q** for full details on assumed waste generation rates.

There are two main construction activities involved as part of the development of the proposed Zoo, being the bulk earthworks phase and the construction of new buildings including exhibits. Calculations of waste result in an estimation of 14,875t of excavation waste from the bulk earthworks, and 838t of waste from the construction of the new buildings on the site. There will also be general wastes generated during construction of car parking areas, the service yard, landscaped areas, animal enclosures and public pathways.

Based on this, it has been estimated in **Appendix Q** that more than 45% of construction wastes will be made up of hard materials, which may be recycled and re-used on-site where possible. The remaining 55% of waste can have half recycled off-site, resulting in an overall recycling rate of greater than 70%.

Operation

There will be a number of potential waste sources during the operation of the Zoo, generating the following broad waste streams:

- Food organics waste;
- Green waste;
- Beverage container recycling;
- General (residual waste);
- Animal carcasses in case of animal death;
- Medical wastes from on-site veterinary services;
- Animal faeces/manure and liquid sludge wastes;
- Wastewater (black water) from wash down of animal back of house and public amenities/toilets;
- Bulk packaging wastes including polystyrene and cardboard boxes;

- Bulky waste items such as furniture and damaged display items;
- Office wastes including clean paper/cardboard and printer toners, ink cartridges and e-waste; and
- Stores, plant and general maintenance wastes.

It is not anticipated that any radioactive waste will be generated in relation to the veterinary services of the Zoo. The potential waste types have been classified in **Table 54**.

Table 54 – Potential operation waste generation classifications

Waste Types	NSW Classification	Proposed Reuse / Recycling / Disposal Method
Visitor Areas / Staff Areas		
General (residual) waste	General solid (putrescible) waste	Disposal at landfill
Recyclable beverage containers (glass and plastic bottles, aluminium cans), tin cans	General solid (non-putrescible) waste	Co-mingled recycling at off-site licensed facility
Food waste	General solid (putrescible) waste	Compost on site or off-site recycling and treatment at a suitably licensed facility.
Clean office paper	General solid (non-putrescible) waste	Off-site recycling at a suitably licensed facility
Bulk cardboard	General solid (non-putrescible) waste	Off-site recycling at a suitably licensed facility
Bulk polystyrene	General solid (non-putrescible) waste	Disposal at landfill
E-waste, batteries, printer toners and ink cartridges	Hazardous waste	Off-site recycling
Staff and public amenities (sewage)	Liquid (trade) waste	Off-site disposal at licensed facility or disposal direct to sewer where arranged with Sydney Water
Animal Housing / Care		
Animal faeces/manure, animal bedding	General solid (putrescible) waste	Compost on site or off-site recycling and treatment at a suitably licensed facility.
Animal waste sludge collected from pond areas	General solid (putrescible) waste	Compost on site or off-site recycling and treatment at a suitably licensed facility.
Animal carcasses	Clinical and related waste (where used for medical research). General solid (putrescible) waste	Appropriate handling and processing for medical research or off-site disposal / incineration at a suitably licensed facility.
Medical / veterinary wastes (e.g. sharps)	Clinical and related waste	Off-site disposal at a suitably licensed facility.
Animal housing washdown liquids (sewage / blackwater) including sanitisation chemicals	Liquid (trade) waste	Off-site disposal at licensed facility or on-site treatment prior to disposal to the sewer or direct disposal to sewer where arranged with Sydney Water.
Maintenance		
Light bulbs / fluorescent tubes	Hazardous waste	Off-site recycling
Furniture / bulky items	General solid (non-putrescible) waste	Off-site reuse or disposal to landfill
Spent Smoke Detectors[1]	General solid (non-putrescible) waste or Hazardous waste (commercial varieties)	Disposal at landfill or offsite disposal at licensed facility
Glass (other than containers)	General solid (non-putrescible) waste	Off-site recycling
Cleaning chemicals, solvents, area wash downs, empty oil / paint	Hazardous waste if containers used to store Dangerous Goods (Class 1, 3, 4, 5 or 8) and residues not been removed.	Transport to comply with the transport of Dangerous Goods Code for off-site recycling or disposal at licensed facility.

Waste Types	NSW Classification	Proposed Reuse / Recycling / Disposal Method
drums / chemical containers	General solid (non-putrescible) waste if containers cleaned by triple washing or vacuuming	Discharge to sewer subject to Trade Waste Agreement with Sydney Water[1]
Air-conditioning parts, air/water filters	General solid (non-putrescible) waste	Disposal to landfill
Garden organics/green waste (lawn mowing, leaves, branches, cuttings)	General solid (non-putrescible) waste	Compost on site or off-site recycling and treatment at a suitably licensed facility.

Source: http://www.environment.nsw.gov.au/waste/envguidlns/index.htm

Note 1: The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) have special disposal requirements for disposal of more than 10 smoke alarms. Contact ARPANSA for more information. http://www.arpansa.gov.au

Source: SLR Consulting (Appendix Q)

Industry standard generation rates have been used to calculate the following conservative waste generation volumes. These have been calculated based on an average visitation period and a peak visitation period. The proposed number of waste bins for the development has also been calculated (**Table 55** and **Table 56**). For a full breakdown of waste generation rates and outcomes for these waste sources, refer to the Waste Management Plan at **Appendix Q**.

Table 55 – Estimated operational waste generation rates for average visitation periods

Building Component	General Waste Generation Average L/day	Recycling Generation Average L/day	General Waste Mobile Garbage Bins	Recycling Mobile Garbage Bins
Entry including gift shop	138	322	1 x 240L	1 x 660L
Kiosks	119	466	2 x 240L	2 x 240L
Boma/Restaurant	1,997	1,208	3 x 660L	2 x 660L
Curatorial and Food Preparation	966	522	2 x 660L	1 x 660L
Administration Offices	25	19	1 x 240L	1 x 660L
Administration Lunch Area	123	480		
Veterinary Centre	71	20	1 x 240L	1 x 240L
Car park (including overflow)	403	403	Refer to **Table 57**	
Estimated total volumes	**3,439**	**3,036**	**5 x 240L**	**3 x 240L**
Estimated total tonnage	**0.52**	**0.19**	**5 x 660L**	**5 x 660L**

1. All waste generation rates are approximate

Source: SLR Consulting (Appendix Q)

Table 56 – Estimated operational waste generation rates for peak visitation periods

Building Component	General Waste Generation Average L/day	Recycling Generation Average L/day	General Waste Mobile Garbage Bins	Recycling Mobile Garbage Bins
Entry including gift shop	202	1,012	1 x 240L	2 x 660L
Kiosks	119	469	2 x 240L	2 x 240L
Boma/Restaurant	4,645	2,044	8 x 660L	4 x 660L
Curatorial and Food Preparation	1,044	757	2 x 660L	2 x 660L
Administration Offices	50	37	1 x 240L	1 x 660L
Administration Lunch Area	123	483		
Veterinary Centre	163	35	1 x 240L[2]	1 x 240L
Car park (including overflow)	806	806	Refer to **Table 57**	
Estimated total volumes	**6,346**	**4,837**	**5 x 240L**	**3 x 240L**

Building Component	General Waste Generation Average L/day	Recycling Generation Average L/day	General Waste Mobile Garbage Bins	Recycling Mobile Garbage Bins
Estimated total tonnage	0.95	0.30	10 x 660L	9 x 660L

1. All waste generation rates are approximate
2. Emptied as necessary

Source: SLR Consulting (Appendix Q)

Approximately 43% to 47% of typical waste amounts generated within buildings may be recycled, excluding separate collection of the food waste stream. Annual waste generation has been estimated and taken into account fluctuation in peak and off-peak patronage. Assuming a maximum of 73 peak days per year (during the school holiday period), the total estimated waste volumes are calculated to be in the range of 1,467kL (220t per annum) per annum for general waste, and 1,240kL (78t per annum) for recycling. This assumes the remaining 292 days per year are off-peak or average patronage days.

Waste and recycling rates for public areas within the Zoo, including the car park, entry building, public pathways and picnic areas, have been estimated by SLR using previous data from similar projects in nature and scale. These rates are provided below in **Table 57**, and indicate that approximately 49% of public place waste may be recycled.

Table 57 – Estimated peak public place waste generation

Public Place	Waste (L/day)	Recycling (L/day)
Annual volume	1,744	849
Annual tonnages	0.26	0.05

Source: SLR Consulting (Appendix Q)

Organic waste will be generated through a variety of sources, including food waste, animal manure (including hippopotamus faeces) and green waste. The Zoo is anticipated to provide a maximum of 369t per annum of organic waste. This will be composted on-site.

Furthermore, waste water from the wash down of exhibit back of house buildings is anticipated to produce between 10,480L/day and 31,440L/day depending on low or high generation periods. This wastewater will be directed to sewer.

An estimated 0.16t per year of medical waste is expected by operation of the veterinary services at the Zoo, based on past projects of similar scale and nature as undertaken by SLR. Medical wastes will be collected by an authorised disposal contractor.

6.7.2 Mitigation Measures

A number of waste management mitigation measures and safeguards have been identified to address the impacts of the proposal during construction and operation. Further measures are provided within the WMP at **Appendix Q** which will be implemented during the construction and operation of the Zoo.

Table 58 – Waste management safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Waste generation during construction	Classify, handle and store all removed waste in the construction compounds/laydown areas in accordance with the NSW Waste Classification Guidelines 2009: Part 1 Classifying Waste (DECCW) and Storing and Handling liquids,	Construction contractor	Construction/ operation

Impact	Environmental Safeguard	Responsibility	Timing
	Environmental Protection (DECC, 2007).		
Waste and resource management during construction across the proposal	Prepare a waste and resource management plan (WRMP) as a sub-plan of the CEMP. As a minimum describe the measures for handling, storing and classifying waste when 'onsite' and its subsequent disposal offsite to the relevant licenced facility.	Construction contractor	Construction/ operation
Waste disposal during construction across the proposal	Send all disposed materials to a suitably licenced waste management/landfill facility.	Construction contractor	Construction/ operation
Waste handling and storage during construction across the proposal	Store and segregate all waste at source (e.g. the construction compounds/laydown areas) in accordance with its classification. This includes recycled and reusable materials.	Construction contractor	Construction/ operation
Littering and site tidiness during construction across the proposal footprint	Monitor for waste accumulation, littering and general tidiness during routine site inspections.	Construction contractor	Construction/ operation
Resource recovery during construction across the proposal	Apply resource recovery principles: ▪ Reuse proposal-generated waste materials onsite (e.g. topsoil, recycled aggregate) providing it meets with exemption and classification requirements ▪ Failing that, transfer the materials for use elsewhere on another site under a resource recovery exemption ▪ Employ waste segregation to allow paper, plastic, glass, metal and other material recycling. These materials could be either reused onsite or transferred to a recycling facility ▪ Consider composting general putrescible waste to allow recovery. Transfer these materials offsite to a composting facility.	Construction contractor	Construction/ operation
Reducing primary resource demand during construction across the proposal	Use recycled and low embodied energy products to reduce primary resource demand in instances where the materials are cost and performance competitive (e.g. where quality control specifications allow).	Construction contractor	Construction/ operation

6.8 Landscape Character and Visual Impact

A summary of the visual impacts of the proposed Zoo and proposed mitigation measures are provided below.

6.8.1 Existing Environment

The proposed Zoo is situated within the Western Sydney Parklands Bungarribee Precinct, which is currently undeveloped vacant land occupied by stands of vegetation (refer to **Section 6.10**) and open grasslands. At the southern boundary of the Precinct is the Great Western Highway, a State classified road providing east-west access from Penrith through to Parramatta. Westlink M7 sits further to the west of the site, and Doonside Road to the east, separated by further vacant land of the Western Sydney Parklands.

The lack of built form within the existing site results in the area being considered visually 'quiet'. While this would generally indicate a high sensitivity to change rating, the area is considered to be medium in sensitivity to change given current development plans and the existing Plan of Management for the Parklands.

Key sensitive receivers in terms of visual impact across the site include:

- Residents of the Bungarribee and Doonside Road areas to the east of the site;
- Drivers traveling along the Great Western Highway in both east and west directions; and
- Users of the wider Western Sydney Parklands Bungarribee Precinct.

6.8.2 Potential Impacts

Construction

During construction there would be a temporary impact on the local character and views due to the undertaking of bulk earthwork activities, the establishment of a site compound and the presence of construction equipment. This would introduce a short-term minor negative impact into the area. The landscape character would also be impacted by general construction activities, dust generation and amenity effects (including noise and vibration impacts).

Operation

Built Form

The proposed Zoo will introduce physical structures into a currently vacant land parcel, of which the visual exposure will be to road users of the Great Western Highway, residents of Bungarribee and Doonside Road, and users of the wider Western Sydney Parklands. The built form structures will interrupt some view corridors for the sensitive receivers identified however the proposed vegetative landscaping elements will ensure a contiguous vista across the site. Additionally the proposed signage is in keeping with the future character of the area, when the further development of the business hub occurs. As such, the impact is only considered to be moderate, particularly given the future development proposed as part of the wider Plan of Management for the Western Sydney Parklands which envisages commercial or retail development along the sites frontage to the Great Western Highway in the south and south-eastern portions of the wider Precinct.

The landscape and visual impacts resulting from the built form of the operating Zoo introduced under the proposal are therefore considered to have a moderate impact on the landscape character given the introduction of buildings and other structures. This will be mitigated through the proposed vegetative planting on the boundaries of the Zoo site, which will ensure a contiguous connection with the wider Bungarribee Precinct.

Lighting

As per **Section 3.0**, the proposed Zoo will be mainly lit via Smart Pole flood lights, with under rail lighting proposed along particular internal walkways. The Smart Pole flood lights are proposed to be within exhibits, with pathways lit via bollard and in ground landing lights with 5m spacing. The car parking area will be lit by flood lights with 15m centres.

The impact of obtrusive lighting on external sensitive receivers is managed under AS4282: Control of the obtrusive effect of outdoor lighting. This standard provides three main criteria for assessment:

- Illuminance in the vertical plan: at the property boundary of residential properties;
- Luminous intensity: of the light source, being a measure of the glaring impact of the lighting; and

- Threshold increment: being a measure of the effect that lighting has on the visual performance of drivers on surrounding roads.

Given the site has a buffer zone around its boundaries (the wider Western Sydney Parklands), the vertical illuminance at nearby residential properties will be negligible, particularly when compared to any night time lighting stemming from the nearby Blacktown International Sportspark. As the proposed lighting will be full cut-off fittings which emit no light in or above the horizontal plane, the light sources will not be visible from outside the site, which indicates the luminous intensity external o the site will be negligible. Additionally, the offset between the site and the Great Western Highway, combined with the controlled cut-off fitting of the car park lighting, will remove the potential for threshold increment impacts.

AS4282 identifies the need to control upward light output which creates sky glow, which is made from the light emitted from the fitting directed to the sky, and light that is reflected from other surfaces. With the majority of the Zoo built form being relatively natural with minimal reflectivity, and the illumination levels being approximately 1% of those used in sporting installations, the contribution to sky glow is considered to be minimal.

Proposed Signage

As identified in **Section 3.0**, the proposed Sydney Zoo seeks approval for one 'business identification sign' which will be located above the main entrance to the Zoo as part of the façade of the entry/retail building. General way-finding signage within the car parking area to direct patrons towards the front entrance and exit is also proposed.

A 'business identification sign' is identified within SEPP64 as a sign:

(a) that indicates:

(i) the name of the person, and

(ii) the business carried on by the person,

at the premises or place at which the sign is displayed, and

(b) that may include the address of the premises or place and a logo or other symbol that identifies the business,

but that does not include any advertising relating to a person who does not carry on business at the premises or place.

The entry/retail building signage will be simple text signage approximately 75cm in height. The following **Table 59** is an assessment against the relevant assessment criteria of SEPP64 Schedule 1.

Table 59 – SEPP 64 Signage Assessment Criteria

Assessment Criteria	Comments	Compliance
1 Character of the area		
Is the proposal compatible with the existing or desired future character of the area or locality in which it is proposed to be located?	The proposed business identification signage identifies the entrance to the proposed Sydney Zoo and has been designed to blend in with the wider design of the Zoo buildings and façade.	Y
Is the proposal consistent with a particular theme for outdoor advertising in the area or locality?	The proposed signage is contained within the Zoo site, and is consistent with the design of the proposed surrounding built form.	Y
2 Special areas		
Does the proposal detract from the amenity or visual quality of any environmentally sensitive areas, heritage areas, natural or other	The proposal will not detract from the visual quality or amenity of the surrounding environment. The sign is of a scale that is consistent with the future character of the surrounding area.	Y

Assessment Criteria	Comments	Compliance
conservation areas, open space areas, waterways, rural landscapes or residential areas?		
3 Views and vistas		
Does the proposal obscure or compromise important views?	The proposed signage structure will not obscure or compromise any significant or important views.	Y
Does the proposal dominate the skyline and reduce the quality of vistas?	The proposed signage on the entry/retail building does not dominate the skyline as it is incorporated into the façade of the proposed Sydney Zoo.	Y
Does the proposal respect the viewing rights of other advertisers?	The proposed signage does not obscure or detract from any other signage structures.	Y
4 Streetscape, setting or landscape		
Is the scale, proportion and form of the proposal appropriate for the streetscape, setting or landscape?	The scale, proportion and form of the proposed signage is considered to be appropriate for the future character of the area in accordance with the Western Sydney Parklands Plan of Management.	Y
Does the proposal contribute to the visual interest of the streetscape, setting or landscape?	The proposed signage will provide assistance in providing visual interest to the landscape setting within which the proposed Sydney Zoo is located.	Y
Does the proposal reduce clutter by rationalising and simplifying existing advertising?	There are currently no signs near to the proposed Zoo entry. The nearest sign is an advertising sign used by the WSPT to promote the wider Parklands. That sign is approximately 100m south of the proposed signage.	Y
Does the proposal screen unsightliness?	The proposed signage does not screen any unsightliness.	Y
Does the proposal protrude above buildings, structures or tree canopies in the area or locality?	The proposed sign will not protrude above the general height of proposed Zoo structures within the Bungarribee Precinct.	Y
Does the proposal require ongoing vegetation management?	The proposed signs is located on the entry/retail building to the Sydney Zoo and will not require ongoing vegetation management.	Y
5 Site and building		
Is the proposal compatible with the scale, proportion and other characteristics of the site or building, or both, on which the proposed signage is to be located?	The proposed signage is compatible with the future scale, proportion and other characteristics of the site. While there is no significant development in the locality, the signage has been specifically designed to fit within the context of the site and the future character of the area.	Y
Does the proposal respect important features of the site or building, or both?	The proposed signage respects the existing features of the site as it does not obscure any significant or important views and is not of a scale or visual character that is inconsistent with the future surrounding landscape.	Y
Does the proposal show innovation and imagination in its relationship to the site or building, or both?	The signage will work within the future visual scale and features of the area to deliver a respectful and interesting signage response. Additionally, the proposed vegetation at the base of the signage (excluding the entry/retail building sign) will introduce a clear connection to the site.	Y
6 Associated devices and logos with advertisements and advertising structures		
Have any safety devices, platforms, lighting devices or logos been designed as an integral part of the signage or structure on which it is to be displayed?	No safety devices or platforms are proposed.	Y
7 Illumination		
Would illumination result in unacceptable glare? Would illumination affect safety for pedestrians, vehicles or aircraft?	The proposed signage illumination will not result in unacceptable glare as it will be located within the built form footprint of the Zoo.	Y

Assessment Criteria	Comments	Compliance
Would illumination detract from the amenity of any residence or other form of accommodation?	The proposed signage illumination will not detract from any residential or accommodation facility, as the nearest residential property is located 630m to the south-west of the signage location.	Y
Can the intensity of the illumination be adjusted, if necessary? Is the illumination subject to a curfew?	The proposed signage illumination can be adjusted if necessary through the use of dimming capabilities with the light fixture. The signage will be illuminated until 10pm at night or during the hours of Zoo operation, whichever is earlier.	Y
8 Safety		
Would the proposal reduce safety for any public road?	No, the proposed signage is not located on a public road.	Y
Would the proposal reduce safety for pedestrians/cyclists?	The location and scale of the proposed signage does not pose any adverse impacts on pedestrian or cyclist safety.	Y
Would the proposal reduce safety for pedestrians, particularly children, by obscuring sightlines from public areas?	The proposed signage will not obscure sightlines from public areas.	Y

As identified above in **Table 59**, the proposed signage as part of the Zoo complies with the requirements of SEPP 64 and will not have a detrimental impact on the visual or landscape aesthetics of the overall Western Sydney Parklands.

6.8.3 Mitigation Measures

Several landscape character and visual impact mitigation measures have been developed to reduce the impact of the Zoo on the surrounding aesthetics.

Table 60 – Landscape character and visual impact safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Management of the construction works to minimise their visual impacts on nearby streetscape character	▪ Implement a maintenance schedule to ensure the entry to the Parklands from the Great Western Highway remains clear and tidy ▪ Consider screening methods to reduce the visual impact of the work site	Construction contractor	Construction
Light spill impacts during construction across the proposal footprint	▪ Screen, shield and cut-off all temporary site lighting to prevent light spill where possible ▪ Use directional light sources where possible to reduce lateral light spill ▪ Use low luminescence lighting lights where feasible to reduce the lateral light spill ▪ Shield the top of all site lighting to prevent any upward light glare ▪ Remove any lighting conflict with the general street lighting to prevent the risk of motorists becoming disorientated or distracted	Construction contractor	Construction
Operational light spill impacts on adjacent properties	▪ Follow the lighting design specification that aims to ensure any the height and direction of any lighting pole would not introduce sky glow or impacts on neighbouring residential properties or road users of the Great Western Highway ▪ Use directional lighting fixtures with cut-offs and filters as required	Construction contractor/ Sydney Zoo	Detailed design/ Pre-construction

6.9 Contamination

An Environmental Site Assessment was completed for the Sydney Zoo site, and is provided at **Appendix H**. The Environmental Site Assessment included a comprehensive review of relevant documentation in relation to the site history and assessment of potential sources of contamination, as well as carrying site specific investigations to collect and analyse soil samples.

Key results of the investigations are as follows:

- There were no visual or olfactory indications of contamination within the sample locations.
- No contaminants were detected in any soil samples at concentrations in excess of the adopted assessment criteria. The following contaminates were tested for: heavy metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and organochlorine pesticides.
- Asbestos was not detected in any of the soil samples tested.

No contaminants were detected in any groundwater samples at concentrations in excess of the Tier 1 assessment criteria. The following contaminates were tested for:

- heavy metals;
- petroleum hydrocarbons; and
- polycyclic aromatic hydrocarbons.

The soil and groundwater concentrations detected by the laboratory for the site are representative of baseline environmental conditions. Generally, the site is not contaminated, based on the low levels of chemicals of potential concern detected by the laboratory in the locations subjected to investigation.

Based on the results of this investigation, the site is suitable for redevelopment as a zoo without the need for further assessment or remediation.

6.10 Vegetation and Biodiversity

The biodiversity study prepared by Eco Logical Australia (ELA) (**Appendix I**) was undertaken through a number of database searches and review of previous reports and studies in accordance with the survey guidelines identified within the SEARs. These guidelines included the:

- NSW Offset Policy for Major Projects (State Significant Development and State Significant Infrastructure (by OEH); and
- NSW Framework for Biodiversity Assessment (by OEH).

Additionally, the following datasets were reviewed which overlap the Zoo area:

- Western Sydney vegetation mapping (National Parks and Wildlife Service);
- Soil Landscapes of Penrith 1:100,000 Sheet (by Bannerman and Hazelton);
- OEH Atlas of NSW Wildlife;
- EPBC Act Protected Matters;
- Department of Primary Industries (DPI) Fisheries Threatened and Protected Species Records Viewer; and
- DPI Fisheries Key Fish Habitat Map (Sydney LGAs).

A number of field surveys were conducted across the Zoo site as outlined below, including floristic surveys, biometric plots, fauna habitat assessments and a targeted search for the Cumberland Land Snail. These surveys occurred on multiple dates including 29 May 2015, 3 July 2015 and 4 September 2015.

6.10.1 Existing Environment

The site is located within the Cumberland Interim Biogeographic Regionalisation for Australia (IBRA) subregion in the wider Sydney Basin Bioregion, and occurs in a highly urbanised area, surrounded by established urban development, particularly to the east and south.

The site is generally underlain by two main soil landscapes – the South Creek and Blacktown soil landscapes. Both are associated with the Wianamatta Group shales and Hawkesbury Sandstone geology; with Blacktown soil landscapes often underlain by the Wianamatta group Ashfield shales. There are two main creek systems within the area, which occasionally flood, including the south-north flowing Eastern Creek. No SEPP14 wetlands or other important wetlands are situated within or near to the Zoo site. Refer to **Appendix I** for further details.

There were two plant communities identified during the survey. The River Flat Eucalypt Forest (known as Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain) is recorded as an Endangered Ecological Community (EEC) under the *Threatened Species Conservation Act 1995* (TSC Act). The area identified on the site is considered a young stand of replanted vegetation, with some remnant forest present beyond the western boundary of the site. The second plant community is Shale Plains Woodland (Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain), a sub-community of the Cumberland Plains Woodland. This community is listed as an EEC under the TSC Act, but also a Critically Endangered Ecological Community (CEEC) under the EPBC Act. This community occurs in a number of stands across the Zoo site, ranging in quality from poor condition to good condition. Both communities are recorded as being 95% cleared within the region.

No threatened flora species were recorded during the site survey. Ten threatened fauna species and three migratory species have the potential to occur within the Zoo site, however none were identified.

The remainder of the site, in the majority, is covered by exotic grassland. There were 30 weed species with five of those being noxious weed species identified on the site. Three in particular (Asparagus Fern, Prickly Pear and Fireweed) have national significance.

The Ecological Assessment at **Appendix I** provides further details on the current ecological state of the site and outlines ratings for each of the stands of protected species.

6.10.2 Potential Impacts

The Ecological Assessment at **Appendix I** identifies the construction and operational impacts of the proposed Zoo, including direct, indirect and negligible impacts. A summary assessment is provided below.

As identified above, there are two threatened ecological communities within the Zoo site. The proposed Zoo will result in a loss of 0.58ha of River Flat Eucalypt Forest. That vegetation community is identified as being planted, likely within the past five to 10 years, and is interspersed with a number of exotic grasses and weed species as described above. The proposal also results in the removal of 1.07ha of Shale Plains Woodland, comprised of 0.24ha of Cumberland Plain Woodland and 0.83ha of derived native grassland, the latter which does not

require offsets under the Major Projects Offset Policy. Of the 0.24ha of Cumberland Plain Woodland to be removed from the site that requires offsets, only 0.08ha of this is Condition A CPW under the EPBC Act, the remainder of the vegetation is poor to medium quality.

Two hollow bearing trees are likely to be impacted by construction of the proposal however these have been deemed not large enough to provide roosting or habitat values. The presence of weeds within the site area creates potential for weed species to proliferate during ground disturbance works if not properly managed. With the proposed Zoo containing large areas of hardstand and impermeable materials, there may be impacts on the hydrology and ecology of Eastern Creek to the west of the site. These will be managed through a constructed wetland and stormwater harvesting ponds.

Indirectly, the potential for animal pests to be present in the area is a risk, due to the site's location adjacent to urbanised areas. These pests could include the European Red Fox, European Rabbit (presence which was identified during the site surveys) and feral cats.

Further potential impacts include the potential vehicle strikes of fauna during the construction stage. This will be mitigated through speed limited vehicle movements along designated tracks.

During operation, discharge of runoff from the Zoo, particularly from animal enclosures, may increase nutrient loads in nearby areas including Eastern Creek. The proposed wetland and stormwater system will provide filtering of nutrients before discharge from the site.

Other potential impacts from operation of the Zoo include rubbish dumping and accidental trampling of adjacent vegetation.

Offsets Required

Under the Major Projects Offset Policy, offsets would normally be required. However, the Zoo will be planting more native vegetation on-site than currently exists. Further, the Policy is in a transitional period, where negotiation with the NSW Office of Environment and Heritage (OEH) is available in the event that a perverse environmental outcome is achieved through application of the Policy. The proposed seeks to have the ecosystem credits identified within **Appendix I** be delivered through the landscaping works being undertaken on site.

As part of the design of the Sydney Zoo the proposal will plant and maintain a larger area of native vegetation than will be removed. A total of 1.74ha of native vegetation will be planted, compared to the 0.82ha of native vegetation being removed that requires offsets, a net gain in both vegetative area and quality. The increase in vegetation will improve the connectivity of the stands of bushland, and improve animal habitat through introducing nest boxes throughout the site.

The Zoo's Masterplan results in the removal of 0.82ha of vegetation that requires offsetting. The vegetation to be removed is considered to be disconnected and generally low quality in terms of its ecological value, with approximately 0.24ha being Cumberland Plain Woodland across five stands of approximately 500m^2 each in size, with the remainder being young planted eucalypts, of about five years in age. The design of the Zoo has, however, ensured that the best quality stands of Cumberland Plain Woodland will be retained or have minimal disturbance.

An improved ecological outcome is obtained through the enhanced connectivity of the native vegetation currently on site. The Masterplan seeks to achieve this by:

- providing for vegetation buffers along the southern boundary of the site between the Cumberland Plain Woodlands and replanted River Flat Eucalypt Forest on the riparian fringe;
- providing for significant planting of refuge trees and grasses in the car park; and
- planning for the improvement and long term care of Cumberland Plain Woodland stands that are to be retained.

A slightly larger area of replanted eucalypt will be disrupted (0.3ha) in order to provide the higher level of planting proposed as an offset and to ensure the car park design is in accordance with the requirements of the Roads and Maritime Services (RMS). As part of the Development Application consideration, Sydney Zoo proposes that the offset of vegetation be permitted through landscaped planting internal to the site, rather than external off-site bio-banking credits. This is considered to be a suitable and indeed preferable outcome, as it results in a net gain in the area of native vegetation, an improvement in the quality and condition of that vegetation, and improved connectivity of the vegetative stands.

6.10.3 Mitigation Measures

Several mitigation measures are proposed to reduce the impacts on vegetation. Of particular note are the following:

- Avoidance of impacts have been incorporated into the design of the Zoo through:
  - Utilising existing grassland areas; and
  - Relocating the car parking area to avoid removing the larger stand of Cumberland Plain Woodland in the south of the site; and
- Siting of the Zoo footprint on a largely cleared area which reduces the need for vegetation clearing.

Other than standard mitigation measures (including contractor awareness of environmental sensitivity), key project specific measures proposed include the replanting of 1.74ha of native vegetation through the proposed landscaping plan. Additionally, 17 nest boxes will be installed as part of the landscaping plan to replace any tree hollows lost during the clearing works, and any fallen logs will be relocated to adjacent areas within the wider Bungarribee Precinct to provide habitat for fauna species.

Table 61 – Vegetation and biodiversity safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Biodiversity management across the entire proposal footprint	Prepare a biodiversity management plan (BMP) as a sub-plan of the CEMP. As a minimum, the plan would: ▪ Provide for the discovery of unexpected threatened flora or fauna. ▪ Provide for contractor staff training to be aware of the sensitivity of the surrounding environment including threatened ecological communities ▪ Identify impact areas and measures for clearly delineating these areas, using fences or similar means to prevent encroachment of the works into the surrounding bushland.	Construction contractor	Pre-construction
Biodiversity management across the entire proposal footprint	▪ Vegetation / woody debris for removal should be used in adjacent areas for habitat features or mulched for soil	Construction contractor	Construction

Impact	Environmental Safeguard	Responsibility	Timing
	erosion control. ▪ Work in riparian zones (i.e. areas of River Flat Eucalypt Forest) would be undertaken to limit impacts on aquatic flora and fauna, and their habitats. This would include measures to preventing run-off into the adjacent vegetation and creek and clearly delineating the construction area boundaries.		
Noxious weed management	▪ Areas proposed for disturbance where noxious weeds are present should be managed according to the weed class. ▪ Soil containing seeds from exotic grass species should be removed from the site as soon as practicable and / or stored appropriately to prevent their spread. ▪ Wash down machinery before entering the site to limit weed spread.	Construction contractor	Construction
Biodiversity impacts on watercourses and drainage lines	▪ Construction adjacent to drainage lines should be completed during dry periods. ▪ Storage areas should be located away from the drainage lines to minimise risk of pollution and adverse impact to aquatic ecosystems. Installation of sediment and runoff control measures to prevent runoff entering adjacent bushland areas and watercourses. ▪ Potential chemical pollutants (e.g. fuels, oils, lubricants, paints etc.) would be stored in appropriate containers within bunded areas within construction compounds to minimise the risk of the pollution of aquatic environments.	Construction contractor	Construction
Loss of hollow bearing trees	▪ As a precautionary measure ensure a qualified ecologist would be present during the felling/pruning of any identified hollow-bearing trees to manage wildlife that may be disturbed and/or injured. *The ecologist would assess the species and then release them to the nearest suitable habitat if uninjured.*	Construction contractor Sydney Zoo	Construction
Impacts on non-listed species across the entire construction site	▪ As a precautionary measure close-off all excavations overnight, in locations where night works are not planned, to prevent animals becoming trapped ▪ Inspect each excavation prior to the works starting in the morning ▪ Have a designated qualified person that would capture any inadvertently trapped species and release the species into the nearest suitable habitat if uninjured ▪ If construction lighting is required at night direct light beams away from vegetative areas to protect microbats.	Construction contractor	Construction
Loss of habitat for fauna from clearance	▪ Direct seed with native provenance grass seeds or sterile grasses on exposed areas. ▪ Retention of fallen logs and relocation to adjacent areas where possible to provide habitat resources for ground-dwelling species.	Construction contractor Sydney Zoo	Construction
Operational biodiversity management	▪ Prevention of runoff and wastewater from the zoo entering the adjacent watercourse through the implementation	Sydney Zoo	Operation

Impact	Environmental Safeguard	Responsibility	Timing
	of a constructed wetlands and harvesting pond in the west of the site ▪ Ongoing weed control should be undertaken along the length of the works to reduce the impacts of edge effects on adjacent vegetation.		

6.11 Bushfire Management

A Bushfire Risk Assessment for the project has been prepared by Eco Logical Australia at **Appendix J**, which is summarised below. The objectives of bushfire management are (in order of priority):

- To protect human life;
- To protect infrastructure and assets to maintain functionality before and after the passage of bushfires;
- To present the spread and occurrence of bushfires from within the site;
- To provide for bushfire protection work to be undertaken in an environmentally sustainable manner; and
- To maintain fire regimes which are appropriate to conserve environmental values.

As identified in **Section 6.10** there are two main vegetation communities within the site, with multiple stands to be retained through the landscaping of the Zoo site. Additionally, the site is generally flat across the majority of the Zoo footprint, with slopes increasing towards Eastern Creek in the west.

The Zoo site does not have any permanent or inhabited structures within areas surrounded by bushland, other than road and drainage infrastructure, and no items of cultural importance that could be impacted by bushfire. A number of key human, economic and environmental assets have been identified on the site (refer **Table 62** below).

Based on the location, age, construction methodology and applicable policies, a risk assessment of the site has been conducted and is summarised in **Table 62** below. It is identified that the key assets requiring bushfire protection will fall within the Sydney Zoo site, and includes the animals, visitors and exhibit spaces.

Table 62 – Risk Assessment

Asset Type	Asset Sub Type	Asset Name	Likelihood	Consequence	Risk
Economic	Tourist and recreational	Sydney Zoo	Likely	Moderate	Medium
Economic	Commercial	Doonside Interface	Unlikely	Minor	Low
Economic	Commercial	Eastern Creek	Unlikely	Minor	Low
Economic	Tourist and recreational	Western Sydney Parklands	Likely	Minor	Medium
Human settlement	Residential	Bungarribee	Unlikely	Major	Medium
Environmental	EEC	Cumberland Plain Woodland	Likely	Minor	Medium

Source: Eco Logical Australia (Appendix J)

The Cumberland Plain Woodland located along the eastern boundary of the site has potential to carry a bushfire under certain conditions, with the overall fire risk

for the site based on its current state is considered to be moderate. The existing grassland to the north and south of the site (as part of the wider Western Sydney Parklands) has potential to carry grass fires. With additional vegetation and landscaping proposed as part of the redevelopment work within the wider Parklands, the increase in fuel loads may have a flow on effect to fire risk.

There is considered to be a low level of risk posed by bushfire on the subject site, with generally minor hazard reduction measures required, which include the maintenance of access roads and tracks, removal of fuel sources including combustible material and litter, and ensuring minimal vegetation overhand onto building roofs. The design of the Zoo will not impede the implementation of bushfire protection measures within the wider Bungarribee Precinct.

Under the *Rural Fires Act 1997* there is an obligation for prevention of occurrence and spread of bushfire, which will be dealt with by emergency management planning, training and escalation protocols on days identified as having an increased risk. Furthermore, there are no immediately adjacent sensitive receivers which would be impacted by an incident at the Zoo, which is surrounded by open space associated with the wider Western Sydney Parklands.

6.11.1 Mitigation Measures

A number of bushfire management measures are identified in **Table 63**.

Table 63 – Bushfire safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Bushfire management - general	Implement appropriate hazard reduction program in consultation with Western Sydney Parklands and Cumberland Zone Rural Fire Service where woodland vegetation is within or above threshold.	Sydney Zoo	Operation
Bushfire management during operation	Maintain access roads and tracks within the site and consider the following ongoing management of any buildings and landscaped areas: ▪ Removal of combustible material, particularly litter in gutters, near buildings. ▪ Removing excess amounts of fuel from garden areas (including organic mulch). ▪ Ensuring garden plantings do not overhang any buildings, tree canopies are discontinuous, and shrubs are not positioned within two metres of buildings.	Sydney Zoo	Operation
Operational Bushfire Management Plan	Prepare a Bushfire Emergency Management Plan outlining evacuation routes, firefighting protocols and hydrant locations.	Sydney Zoo	Operation

6.12 Hazards and Risk

This section provides consideration and assessment of hazards and risks associated with storage and handling of chemicals and other dangerous goods, and hazards and risks associated with the proposal's construction and operation.

6.12.1 Hazardous Materials Assessment

Screening Thresholds

The Department's guideline Applying SEPP 33 sets out the screening thresholds for different classes of dangerous goods. The relevant thresholds are set out in **Table 64**.

The purpose of the initial State Environmental Planning Policy No. 33 – Offensive and Hazardous Development (SEPP 33) risk screening is to determine if more detailed assessment is required given a certain quality of each type of dangerous good. If storage and transportation of dangerous goods is below these risk screening thresholds then, under SEPP 33, the facility is not considered to be potentially hazardous development and a Preliminary Hazards Analysis is not required.

It is not known at this stage the actual quantities of dangerous goods that will be stored on-site. As such, an assessment of the thresholds at which storage and transportation of these dangerous goods would be expected to result in the potential for impacts has been carried out. The Sydney Zoo will be operated such that these thresholds are not exceeded, and it is highlighted that only very small quantities of dangerous goods will be stored at the site mostly for cleaning purposes, commensurate with other commercial facilities.

Table 64 – Hazardous materials screening analyses

Class of Dangerous Good	Description of Dangerous Good Class	Use at Sydney Zoo	Threshold for Storage at Sydney Zoo	Threshold for Transportation for Sydney Zoo
1. Explosives	Substances or articles used to produce explosions or pyrotechnic effects.	No Class 1 materials will be stored or used at Sydney Zoo.	NA	NA
2 Compressed or liquefied gases, or gases dissolved under pressure	Class 2.1 — flammable gases (gases which ignite on contact with an ignition source).	Liquefied petroleum gas (LPG) will be used for servicing the restaurant.	10 tonne (or 16m^3 (if stored above ground)	Over 30 movements per week or more than 2t per load.
	Class 2.2 — non-flammable, non-toxic gases: gases which are neither flammable nor poisonous whether compressed or cryogenic.	Class 2.2 materials are not considered to be hazardous materials under SEPP 33.	NA	NA
	Class 2.3 — poisonous gases: gases liable to cause death or serious injury if inhaled.	No Class 2.3 materials will be stored or used at Sydney Zoo.	NA	NA
3 Flammable liquids	PGI — highly flammable liquids: boiling point below 35°C.	Highly flammable liquids will not be stored at Sydney Zoo.	NA	NA
	PGII — flammable liquids: flashpoint of less than 23°C and boiling point above 35°C.	Substances such as acetone, and methylated spirits may be stored on site as solvents and degreasing agents. Petrol will also be stored for use in landscape management appliances (lawn mowers etc.).	5t (at 2 m from the site boundary) [1]	Over 45 movements per week or more than 3t per load.
	PGIII — liquids: flashpoint above 23° C but not exceeding 61°C and boiling point greater than 35°C.	Substances such as kerosene, mineral turpentine may be stored on site as solvents and	2 m^3 (at 5 m from the site boundary) [1].	Over 60 movements per week or more than 10t per load.

Class of Dangerous Good	Description of Dangerous Good Class	Use at Sydney Zoo	Threshold for Storage at Sydney Zoo	Threshold for Transportation for Sydney Zoo
		degreasing agents.		
4 Flammable solids	Substances liable to spontaneous combustion and substances which in contact with water emit flammable gases.	No Class 4 materials will be stored or used at Sydney Zoo.	NA	NA
5 Oxidising agents and organic peroxides	Class 5.1 — oxidising agents.	Some cleaning products (including bleach) contain Class 5.1 materials.	2t	Over 30 movements per week or more than 2t per load.
	Class 5.2 — organic peroxides.	No Class 5.2 materials will be stored at Sydney Zoo.	NA	NA
6 Poisonous (toxic) and infectious substances	Class 6.1(a) — poisonous (toxic) substances.	Pesticides may be stored at Sydney Zoo for weed control in the landscaped areas.	0.5t	NA
	Class 6.1(b) — harmful (toxic) substances.	No Class 6.1(b) materials will be stored at the Sydney Zoo.	NA	NA
	Class 6.2 — infectious substances.	No Class 6.2 materials will be stored at Sydney Zoo.	NA	NA
7 Radioactive substances	Materials or combinations of materials which spontaneously emit radiation.	No Class 7 materials will be stored at Sydney Zoo.	NA	NA
8 Corrosive Substances	Substances which by chemical action, will cause severe damage when in contact with living tissue, or in the case of leakage will materially damage or even destroy other goods.	Acids and alkali materials will be used at Sydney Zoo for cleaning purposes.	PG(I)- 5t / 5m^3 PG(II)- 25t / 25m^3 PG(I)- 50t / 50m^3	Over 30 movements per week or more than 2t per load.
9 Miscellaneous Dangerous Goods	Substances and articles which present dangers not covered by other classes.	No Class 9 materials will be stored at Sydney Zoo.	NA	NA

Note 1: The table shows the minimum volume to be stored at a minimum distance from the site boundary as specified in Applying SEPP 33. The threshold increases via a logarithmic relationship setting a larger non-hazardous volume as distance from the boundary increases.

6.12.2 Potential Impacts

Construction

Hazardous Materials

The construction activities may require the temporary storage of oils and diesel. Oils are not classified as dangerous goods under the Australian Dangerous Goods Code. Diesel is classified as a Class C1 Combustible Liquid. Combustible Liquids are not considered hazardous unless they are stored with Class 3 Flammable Liquids. If diesel is stored together with petrol then it is treated as a

Class 3 Flammable Liquid. As no petrol will be stored on-site, storage of diesel at the Sydney Zoo construction site is not considered hazardous.

Minor quantities of other chemicals may be required during construction; however these would be well below the screening thresholds. These would be stored in bunded areas, and site specific controls would be developed to reduce the environmental release of potentially harmful chemicals and to reduce the risk of any such releases entering local waterways.

Construction Hazards

Construction hazards would be present across the entire construction footprint and the haulage routes across the site. These hazards are summarised in **Table 65**.

Table 65 – Construction hazard identification and consequence assessment

Hazard	Potential Consequence	Key Locations
Accidental fuel and chemical spill due to poor management, equipment failure or construction vehicle incident	Water pollution and ground contamination	All construction works across the entire proposal site, however the risks would be potentially greater in works near the western boundary and Eastern Creek
Accidental discharge of sediment laden/contaminated runoff		
Hazardous material and dangerous goods transportation		
Worksite and road traffic accidents (workforce and pedestrian safety)	Human health impacts (injury or death through vehicle strikes)	All construction works across the entire proposal site, however the risks would be greater near site access and exit points
Fire and/or explosion through poor materials handling, storage and management	Water/air pollution and/or ground contamination	All construction works across the entire proposal site
Restricted or delayed emergency access to site for essential maintenance		
Emergency vehicle access delays	Human health impact as a result of delayed access times	All construction works across the entire proposal site,
Dust and pollutant emissions	Air pollution and nuisance	All construction works across the entire proposal site,
Underground utility or services strike	Human health and biodiversity impact ▪ Injury or death ▪ Water pollution and/or ground contamination Damage to property ▪ Loss of service (socioeconomic ▪ impact)	All construction works across the entire proposal site,

Operation

Hazardous Materials

Only small quantities of dangerous goods would be stored at Sydney Zoo. Dangerous Goods that would be stored are solvents, paints, cleaning fluids, greases, acids and alkali materials – which would be used for cleaning (and disinfecting) buildings and surfaces, minor repairs and maintenance. These dangerous goods are identified where relevant in **Table 64**, and are discussed further below.

All dangerous goods will be stored inside buildings or other appropriate storage facilities. Given the low quantities of materials to be stored at the site, and the commitment to store volume below the thresholds set out in *Applying SEPP 33*, a PHA is not considered to be necessary.

Class 2.1 Compressed Flammable Gases

LPG cylinders would be used to service the restaurant. It is expected that up to approximately 2m3 would be required to be stored at Sydney Zoo at any one time. This is well below the screening threshold for above-ground storage of 10t or 16m3. Standard LPG cylinders of up to 210kg would be used; meaning up to 10 cylinders would be stored at the Sydney Zoo site at any time. Sydney Zoo will store significantly less than the screening threshold quantity of Class 2.1 Compressed Gases (LPG), and so is not potentially hazardous.

Class 3 Flammable Liquids

Substances such as acetone, kerosene, mineral turpentine and methylated spirits may be stored on site as solvents and degreasing agents. These substances are within Packaging Groups II and III. In addition up to 400L (0.4m3) of petrol would be stored for the purposes of operating landscaping appliance such as lawn mowers and whipper snippers. This volume of petrol equates to approximately 0.3 tonnes. The dangerous goods store would be located approximately 10 metres from the north-western boundary of the site. At that distance approximately 35 tonnes of Class 3 Flammable Liquids (PGII or PGIII) could be stored below the potentially hazardous threshold. Sydney Zoo would store significantly less than the screening threshold quantities of Class 3 Flammable Liquids (which would be unlikely to ever exceed 1 tonne), and so would not be considered to be potentially hazardous.

Class 5 Oxidising Agents

Applying SEPP 33 sets a screening threshold for all Class 5.1 Oxidising Agents of 5 tonnes except for dry pool chlorine at a dedicated pool supply shop and ammonium nitrate at land where a rural industry is carried out, neither of which apply to Sydney Zoo. Class 5.1 Oxidising Agents are found in come commercial cleaning products (e.g. bleach) and may be stored at Sydney Zoo. Sydney Zoo will also need to store small quantities of chlorine for treating Hippopotamus wastewater streams, and dosing some moats/ponds. In total, Sydney Zoo will ensure that storage of all Class 5.1 Oxidising Agents on-site, if combined, would not exceed 4.9 tonnes. As such, Sydney Zoo would not be considered to be potentially hazardous.

Class 6 Poisonous Substances

Sydney Zoo will use only small amounts of commercial pesticides for managing on-site landscaping. Sydney Zoo would not store more than 0.45 m^3 at any one time, and so would not be considered to be potentially hazardous.

Class 8 Corrosive Substances

Acids and alkali materials may be used at Sydney Zoo for cleaning purposes. Applying SEPP 33 sets a different screening threshold for each different packaging group as shown in **Table 64**, with the lowest minimum threshold relating to Packaging Group I materials at 5 tonnes. Sydney Zoo would ensure that the volumes of Class 8 Corrosive Substances stored on-site, in aggregate, would not exceed 4.9 tonnes, and so would not exceed the lowest threshold for Class 8 Corrosive Substances. As such, Sydney Zoo would not be considered to be potentially hazardous.

Transportation Thresholds

Because of the small volumes of dangerous goods to be stored at Sydney Zoo, the transportation thresholds set out in *Applying SEPP 33* will not be exceeded.

Applying SEPP 33 does not contain a threshold for the transportation of Class 6.1(a) Poisonous Substances (i.e. pesticides). It is not expected that more than one movement per week would be required for the delivery of small quantities of pesticide to the site would be required.

Operational Hazards

Hazards during operation would be limited to those associated with the operating and maintenance of the Zoo. These would be managed through the standard operating procedure protocols of Sydney Zoo.

These potential hazards include the movement of animals between enclosures, slip and trip hazards on pedestrian pathways, and car park vehicle incidents.

6.12.3 Assessing Offensiveness

Applying SEPP 33 provides guidance as to what should be considered 'potentially offensive industry'. It recommends that the consent authority consider the following:

- Does the proposal require a licence under any pollution control legislation administered by the DECCW or other public authority? If so, the proposal should be considered potentially offensive.
- If such a pollution control licence or approval is not required, does the proposal cause offence having regard to the sensitivity of the receiving environment by emitting a polluting discharge which would cause a significant level of offence?

The Sydney Zoo does not require an Environment Protection Licence from the EPA. This EIS includes assessments of water discharges, air (odour) discharges and noise, and the potential impacts arising from these discharges. The assessments in all cases conclude that there is not likely to be any discharge that would cause a significant level of offence. As such, the Sydney Zoo is not considered potentially offensive.

6.12.4 Conclusion

The volumes to be stored at Sydney Zoo will be managed to be substantially less than the relevant minimum threshold set out in *Applying SEPP 33.*

The Sydney Zoo does not require an Environment Protection Licence from the EPA and is not likely to emit a polluting discharge which would cause a significant level of offence

As such, Sydney Zoo would not be considered to be potentially hazardous or potentially offensive and no further assessment under SEPP 33 (such as a PHA) is required.

6.12.5 Mitigation Measures

The management measures that would be implemented to address the hazards identified above are outlined below. A number of these, including air pollution and nuisance and water pollution or ground contamination would be managed under measures identified in the relevant sections of this EIS.

Table 66 – Hazards and risks safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Construction hazard and risk management across the proposal	Prepare a hazard and risk management plan (HRMP) as a sub-plan of the CEMP. As a minimum, the plan would: ▪ Include an emergency response plan ▪ Be prepared by a suitably qualified hazard management specialist ▪ Provide for the implementation, monitoring and maintenance of the identified hazard controls.	Construction contractor	Pre-construction
Accidental spillage and discharge across the proposal during construction	▪ Keep wet and dry spill kit, sand-filled/gravel-filled socks and geotextile matting 'onsite' at all times. ▪ Train staff in the appropriate deployment, use, removal and disposal of spill kit.	Construction contractor	Construction
Workforce and public safety during construction across the proposal	Fence off and secure the site to prevent public access.	Construction contractor	Construction
Workforce and public safety during construction across the proposal	▪ Use terracing excavation methods where applicable. ▪ Backfill or cover all open excavations with boards/plates outside of working hours.	Construction contractor	Construction
Workforce and public safety during construction across the proposal	Inspect the entry connection into the Parkland Access Road ahead of any required demobilisation to ensure there are no road-user or pedestrian hazards.	Construction contractor	Construction
Hazardous material and dangerous goods transportation to the construction site during construction	Handle and use dangerous goods and hazardous materials in accordance with: the NSW *Occupational Health and Safety Act 2000*; the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008).	Construction contractor	Construction
Utility or services strike across the proposal during construction	Undertake detailed utility surveys as part of the detailed design along with utility-provider consultation.	Construction contractor Sydney Zoo	Construction
Utility or services strike across the proposal during construction	Prepare and work to a utility and services plan. No work would take place outside of this plan without additional consultation and utility searches.	Construction contractor	Construction
Hazardous material and dangerous goods transportation and storage across the site during operation	Handle, store and use dangerous goods and hazardous materials in accordance with: the NSW *Occupational Health and Safety Act 2000*; the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008).	Sydney Zoo	Operation
Hazardous material and dangerous goods storage during operation	Hazardous materials and dangerous goods will be store within a bunded and secure storage facility on-site.	Sydney Zoo	Operation
Driver safety across the proposal during operation	Incorporate car park signage to indicate direction of travel and traffic calming devices including speed humps and speed limits,	Sydney Zoo	Detailed design/Operation

6.13 Ecologically Sustainable Development (ESD)

This section assesses the proposal's potential greenhouse gas impacts and ecologically sustainable development capability.

6.13.1 Energy Efficiency

The proposed development has been designed to incorporate principles of ecologically sustainable development, particularly through building orientation and re-use of water on-site. A Section J report will be prepared during the detailed design of the proposed Zoo. A Section J report identifies the energy efficiency measures proposed as part of a development with the objective to reduce greenhouse gas emissions.

In particular, the Energy Efficiency and ESD report prepared by SLR at **Appendix P** identifies a number of green energy initiatives that are to be investigated further by Sydney Zoo during operation. These initiatives include:

- Photo-voltaic system for the energy needs of the Zoo;
- Standalone solar parking and street lighting;
- Bio-waste gas powered generator systems;
- Micro hydroelectric generation;
- Green power initiative; and
- Building lighting and appliance selection ratings.

Full details on each of these potential initiatives are provided at **Appendix P**.

6.13.2 Building Structure

The main buildings (entry/retail, Boma/restaurant, administration and the habitat buildings) have been assessed for solar access and natural ventilation. The assessment indicates that all buildings (excluding the habitat building which requires no daylight penetration) have good solar access due to north-facing facades and larger areas of glazing and open spaces. Additionally, the entry/retail building and the Boma/restaurant also receive good levels of cross ventilation through the use of open windows and doorways. Ceiling fans will assist with air movement to provide passive cooling during warmer days.

6.13.3 Water Usage

As described previously in **Section 6.4** the Zoo proposes to re-use grey water and store storm and rainwater to reduce potable water usage. The provision of 2,100m^3 of storage for stormwater harvesting is considered to provide an efficient result for the Zoo that meets the water conservation intent established by Blacktown City Council. Additional water efficiency measures that will be investigated during detailed design include the use of water efficient fixtures such as 4 and 5 star rated bathroom and kitchen taps, amongst other fittings. Separate water meters for each building will also be considered to determine areas of higher water use.

6.13.4 Transport

Part of the energy efficiency initiatives of the Zoo will be to promote the use of public transport (to be further investigated during detailed design). Furthermore, as referred to in **Section 6.3** an Operational Transport Management Plan will be prepared for the Zoo. There is also potential for the provision of a number of car spaces to be designated for low-emission or alternative fuel vehicles (electric cars).

The Energy Efficiency and ESD Report at **Appendix P** provides a full description of all energy efficient measures proposed for the project.

6.13.5 Greenhouse Gas

A greenhouse gas emissions assessment has been completed by Wilkinson Murray at **Appendix R**, with a summary provided below. The following greenhouse gases have been identified as significant contributors to global warming:

- Carbon dioxide (CO2);
- Methane (CH4);
- Nitrous oxide (N2O);
- Synthetic gases; and
- Hydro fluorocarbons HFCs, SF6, CF4, C2F6.

No significant emissions of HFCs and synthetic gases are likely to occur as a result of the construction or operation of the project and have therefore been omitted from the remainder of the assessment.

Construction Impacts

There will be significant greenhouse gas emissions from the project during the construction phase, namely from the machinery required during the bulk earthworks component. This is expected to take between three and four months, with the remaining construction activities over approximately nine months. The assessment has assumed that the operation of mobile plant outside of the bulk earthworks phase will be negligible in terms of the overall emissions of the project. The CO2 equivalent emissions from the construction of the project are summarised in **Table 67** below.

Table 67 – Estimated construction emissions

Source	CO_2-e emissions (tonnes)
Diesel	507
Electricity	16
Total	523

Source: Wilkinson Murray (Appendix R)

Operational Impacts

During operation there will be emissions stemming from the use of electricity for the project, with an estimated (assuming a base electrical load of 45% of the peak electrical load for the Zoo, and a power factor of 0.95) 7,826t per year from a number of sources, including lighting of buildings and operation of pumps associated with the stormwater management system.

Furthermore, methane (CH_4) emissions have a global warming potential 21 times higher than that of CO_2. Certain species of animals emit significant amounts of methane due to their digestive systems. These have been assessed to ascertain the level of emissions per annum, based on conservative animal numbers. These species which are known to emit higher levels of methane and will be displayed at the Sydney Zoo include antelopes, giraffes and hippopotamuses. These species are estimated to produce 52t per annum of methane, during operation of the Zoo.

Overall Emissions

The total estimated annual greenhouse gas emissions during the construction and operation of the Zoo are 523t CO_2-e and 7,878t CO_2-e, respectively. During 2012, Australia's total greenhouse gas emissions amounted to 554.6 million

tonnes of carbon dioxide equivalent ($MtCO_2$-e), and New South Wales accounted for 154.7 Mt of that total. Therefore, operation of the project will account for less than 0.005% of current NSW emissions.

6.13.6 Mitigation Measures

The management measures that would be implemented to address the greenhouse gas impacts identified above are outlined below.

Table 68 – Ecologically sustainable development safeguards and management measures

Impact	Environmental Safeguard	Responsibility	Timing
Energy efficiency measures during operation	▪ Investigate opportunities for alternate energy provision after an initial review period of operation	Sydney Zoo	Operation
Building performance during operation	▪ Prepare a Section J energy efficiency assessment of the main buildings during the detailed design stage to determine possible energy saving measures	Sydney Zoo	Detailed design
Water usage	▪ Implement water efficient fittings and fixtures into building design	Sydney Zoo	Detailed design
Transport during operation	▪ Promote the use of public transport for patrons and staff ▪ Prepare an OTMP as outlined in Section 6.3.3	Sydney Zoo	Operation
Greenhouse gas emissions during construction	▪ Recycle or compost waste were possible ▪ Choose nearby sources of fill and other building materials to reduce transport emissions ▪ Ensure construction plant is regularly maintained to ensure optimum fuel efficiency ▪ Where possible, operate construction plant at lower power settings to conserve fuel, and switch off engines when not in use ▪ Plan construction activities to avoid double handling of fill and other materials.	Construction contractor	Construction
Greenhouse gas emissions during operation	▪ Utilise energy efficient building design features such as natural ventilation and lighting, and insulation ▪ Consider on-site renewable energy, such as solar power ▪ Investigate the feasibility of using electric powered mobile plant on site.	Sydney Zoo	Operation

6.14 Socio-economic Impacts

The proposed Sydney Zoo is situated within the region generally referred to as Western Sydney, and will have a number of socio-economic impacts on that wider community.

As mentioned previously, the Zoo is proposing to be a key player in the conservation of flora and fauna species, through the participation in international breeding programs. There are current discussions underway with the Australian Wildlife Conservancy to form an alliance to begin the preparation of a suitable conservation program. Furthermore, these conservation programs will lead into the wider educational framework which the Zoo is seeking to undertake. These education programs will focus on a variety of topics including:

- How conservation of ecosystems is important for future generations;
- The local Aboriginal heritage of the area; and
- The local natural and colonial heritage within the region.

It is expected that the Sydney Zoo will become a destination of choice for school excursions. As such, the Zoo will prepare age-appropriate educational materials and activities to facilitate this, in accordance with the relevant school curricula at the time.

With the wider plans for the Bungarribee Precinct under the Western Sydney Parklands Plan of Management, the Zoo complements the concept for a tourism and business hub in this location. Accordingly the development of the wider Precinct as a destination recreational space will allow for an increase in the available recreational facilities for the growing Western Sydney community. Furthermore, the Zoo, as the main tourism development within the Precinct, will be complemented by the future business hub proposed along the site's frontage to the Great Western Highway. As mentioned earlier, the Sydney Zoo is leasing the site from the WSPT under a contractual agreement. The Zoo has no say in where the funding from that lease is used, with that being a WSPT decision.

As identified in **Section 2.5.1**, Featherdale Wildlife Park provides a similar tourism offering including animal experiences to those proposed by the Sydney Zoo. However Featherdale generally focuses on farmyard and native Australian species whereas Sydney Zoo will include exotic species.

In particular, Sydney Zoo has approximately 11,000m^2 of Australian species exhibits, a small proportion (10%) of the total exhibit space, significantly less than that of Featherdale. The majority of exhibit space within the proposed Zoo is dedicated to exotic species. The Zoo will also have approximately 40 Australian species, again, less than that of Featherdale, and will provide a significant number of fish, insects and nocturnal species which Featherdale do not display.

Furthermore, the Zoo is not proposing an aviary, whereas Featherdale has a key focus on bird species, which was its main focus upon opening.

Accordingly, the proposed Zoo and Featherdale provide for differing experiences for guests. This point of difference will ensure that the patronage for both attractions is sourced from different markets, and offers the chance for the Zoo and Featherdale to complement each other's animal experience offerings.

The current growth of the tourism market and the general population in Western Sydney suffers from a lack of accessibility to the education and conservation opportunities provided by Taronga Zoo, located over 35km to the east of the Zoo site. Subsequently, there is a lack of equity and fairness to the growing population of the wider Western Sydney region in regards to those key concepts. It is this gap in conservation and educational opportunities which the Sydney Zoo seeks to fill through its operations in the Western Sydney Parklands.

The Economic Report prepared by KPMG at **Appendix S** identifies the contribution of the Zoo to the wider NSW economy. The report identified that the economic impacts of the Zoo come from three major components:

- Construction and operation;
- Offsite spending of visitors attracted or retained due to their visit to the Zoo; and
- Expenditure associated with travel costs from visitors to the Zoo.

With over $60m worth of benefits during the construction period, the annual impact on the wider NSW economy is estimated to be approximately $45m, equating to about 160 incremental full time person years of employment. The operation of the Zoo is anticipated to generate an on-going impact of between 120 jobs (base) and 210 jobs (high) per annum. Refer to the Economic Report at **Appendix S** for a full description of the economic impacts of the proposed Zoo.

7.0 Environmental Risk Assessment

The Environmental Risk Assessment (ERA) establishes a residual risk by reviewing the significance of environmental impacts and the ability to manage those impacts. The ERA for the Sydney Zoo has been adapted from Australian Standard AS4369.1999 Risk Management and Environmental Risk Tools.

In accordance with the SEARs, the ERA addresses the following significant risk issues:

- the adequacy of baseline data;
- the potential cumulative impacts arising from other developments in the vicinity of the Site; and
- measures to avoid, minimise, offset the predicted impacts where necessary involving the preparation of detailed contingency plans for managing any significant risk to the environment.

Figure 24 indicates the significance of environmental impacts and assigns a value between 1 and 10 based on:

- the receiving environment;
- the level of understanding of the type and extent of impacts; and
- the likely community response to the environmental consequence of the project.

The manageability of environmental impact is assigned a value between 1 and 5 based on:

- the complexity of mitigation measures;
- the known level of performance of the safeguards proposed; and
- the opportunity for adaptive management.

The sum of the values assigned provides an indicative ranking of potential residual impacts after the mitigation measures are implemented.

Significance of impact	Manageability of impact				
	5 Complex	4 Substantial	3 Elementary	2 Standard	1 Simple
1 – Low	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)	3 (Low)	2 (Low)
2 – Minor	7 (High/Medium)	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)	3 (Low)
3 – Moderate	8 (High/Medium)	7 (High/Medium)	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)
4 – High	9 (High)	8 (High/Medium)	7 (High/Medium)	6 (Medium)	5 (Low/Medium)
5 – Extreme	10 (High)	9 (High)	8 (High/Medium)	7 (High/Medium)	6 (Medium)

Figure 24 – Risk Assessment Matrix

Table 69 – Environmental risk assessment

				Risk Assessment		
Item	**Phase**	**Potential Environmental Impact**	**Proposed Mitigation Measures**	**Significance of Impact**	**Manageability of Impact**	**Residual Impact**
Air and Odour	Construction	Dust and particulate matter impacts on nearby sensitive receivers	Refer to Section 8.0. This would be dealt with under the CEMP. Appropriate dust management measures would be implemented by the construction contractor.	Minor (2)	Standard (2)	Low/Medium (4)
Air and Odour	Operation	Odour impacts on nearby sensitive receptors	Refer to Section 8.0. This would be dealt with under the CEMP.	Minor (2)	Standard (2)	Low/Medium (4)
Noise	Construction	Construction noise on nearby receivers	Refer to Section 8.0. A Construction Noise and Vibration Management Plan would be prepared.	Moderate (3)	Elementary (3)	Medium (6)
Noise	Operation	Night time sleep disturbance from roaring lions	Refer to Section 8.0. Roaring lions at night are not considered to have an impact on nearby receivers due to the separation distance.	Moderate (3)	Standard (2)	Low/Medium (5)
Traffic	Construction	Construction traffic impacts on nearby roads	Refer to Section 8.0. A Construction Traffic Management Plan will be prepared.	Moderate (3)	Standard (2)	Low/Medium (5)
Traffic	Operation	Peak period traffic impacts and initial opening period traffic impacts	Refer to Section 8.0. An initial opening transport management, and an operational Transport Management Plan will be prepared.	Minor (2)	Standard (2)	Low/Medium (4)
Stormwater Management	Construction	Erosion and sediment runoff to watercourses during construction	Refer to Section 8.0. A Stormwater Management Plan and Erosion and Sediment Control Plan will be prepared to outline mitigation measures which could include silt fencing.	Moderate (3)	Elementary (3)	Medium (6)
Aboriginal heritage	Construction	Unexpected heritage find during construction	Refer to Section 8.0. Works would cease immediately.	Low (1)	Standard (2)	Low (3)
Non-Aboriginal Heritage	Construction	Unexpected heritage find during construction	Refer to Section 8.0. Works would cease immediately.	Low (1)	Standard (2)	Low (3)
Waste management	Construction	General site littering and impacts on neighbouring properties	Refer to Section 8.0. A Waste and Resource Management Plan will be prepared, including requirements to manage waste disposal on-site.	Moderate (3)	Elementary (3)	Medium (6)
Landscape character and visual impact	Construction	Potential night time works introducing light spill into the area	Refer to Section 8.0. All lights will be shielded and directed away from sensitive receivers including motorists on the Great Western Highway	Minor (2)	Standard (2)	Low/Medium (4)
Landscape character and	Construction	Introduction of new elements into the visual landscape.	Refer to Section 8.0. The Zoo is designed to complement with the existing vegetated character of the site, through the use of landscaping and native species.	Minor (2)	Standard (2)	Low/Medium (4)

				Risk Assessment		
Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures	Significance of Impact	Manageability of Impact	Residual Impact
visual impact						
Landscape character and visual impact	Operation	Operational light spill and glow	Refer to Section 8.0. Light specifications will be reviewed to ensure selection of fixtures does not introduce sky glow.	Minor (2)	Elementary (3)	Low/Medium (5)
Biodiversity	Construction	Noxious weed spread	Refer to Section 8.0. Areas where noxious weeds are present will be managed according to that weeds class, and soil containing seeds of exotic species will be removed from the site as quickly as possible to prevent their spread.	Minor (2)	Standard (2)	Low/Medium (4)
Biodiversity	Construction	Impacts on watercourses and drainage lines	Refer to Section 8.0. A Biodiversity Management Plan will be prepared. Construction adjacent to drainage lines should be completed during dry periods. Potential chemical pollutants (e.g. fuels, oils, lubricants, paints etc.) will be stored in appropriate containers within bunded areas within construction compounds to minimise the risk of the pollution of aquatic environments.	Moderate (3)	Elementary (3)	Medium (6)
Biodiversity	Operation	Impacts on watercourses and weed species	Refer to Section 8.0. The construction of the proposed OSD basins will reduce the risk of runoff and wastewater entering the adjacent watercourse. Ongoing weed control will be undertaken as part of Zoo maintenance protocols.	Moderate (3)	Elementary (3)	Medium (6)
Bushfire	Operation	Access and safety during bushfire events	Refer to Section 8.0. A Bushfire Emergency Management Plan will be prepared, including evacuation routes and on-going requirements for maintenance to minimise fuel loads.	Minor (2)	Elementary (3)	Low/Medium (5)
Hazards and risk	Construction	Accidental spillage and chemical incident	Refer to Section 8.0. A Hazard and Risk Management Plan would be prepared. The site would be fenced off and secured from public access. All dangerous goods would be stored in a secure area.	Low (1)	Standard (2)	Low (3)
Hazards and risk	Operation	Accidental spillage of hazardous material and dangerous goods	Refer to Section 8.0. Handle, store and use dangerous goods and hazardous materials in accordance with: the NSW Occupational Health and Safety Act 2000; the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008). Hazardous materials and dangerous goods will be store within a bunded and secure storage facility on-site.	Low (1)	Standard (2)	Low (3)

8.0 Mitigation Measures

The collective measures required to mitigate the impacts associated with the proposed works are detailed in **Table 70** below. These measures have been derived from the previous assessment in **Section 6.0** and those detailed in appended consultants' reports.

Table 70 – Summary of site specific environmental safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
General			
General	All environmental safeguards must be incorporated within the following: ▪ Project Environmental Management Plan ▪ Detailed design stage ▪ Contract specifications for the proposal ▪ Contractor's Environmental Management Plan	Project manager	Pre-construction
General	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Contractor	Pre-construction and during construction as required.
Air and Odour			
Air quality emissions – general management	▪ Reduce drop heights during loading and unloading of fill material ▪ Minimise area of exposed surfaces ▪ Minimise amount of stockpiled materials ▪ Where possible, apply barriers, covering or temporary rehabilitation ▪ Rehabilitate completed sections as soon as practicable ▪ Restrict construction activities during unfavourable weather conditions Water carts and sprays to be used to suppress instances of dust transportation	Construction contractor	Construction
Air quality emissions through vehicle movements	▪ All construction plant, equipment and vehicles to be properly maintained and operated so as to alleviate excessive exhaust emissions ▪ Engines of construction plant to be switched off when not in use Limit vehicle speeds on-site to 40km/h	Construction contractor	Construction
Air quality emissions through loading and transport of materials	Waste and material loads leaving the subject site are to be covered at all times	Construction contractor	Construction
Air quality emissions	Any material deposited on the road network due to truck movements to and from the site would be either prevented or cleaned up immediately.	Construction contractor	Construction
Odour management across the site	▪ Procedures for staff to report the presence of odours, particularly in unexpected places; ▪ If composting windrows require turning, this should be done during periods of good atmospheric dispersion Maintaining an odour complaints register which captures all complaints from patrons and off-site receptors	Sydney Zoo	Operation
Noise			
The potential for exceedance of the NMLs across the proposal footprint	Prepare a construction noise and vibration management plan (CNVMP). It would be a sub-plan of the CEMP. As a minimum, the plan would:	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	▪ Map the sensitive receiver locations including residential properties ▪ Include safeguards and management measures to manage out of hours working ▪ Include a assessment to determine potential risk for activities likely to affect receivers, including for activities undertaken during and outside of standard working hours ▪ Include a process for assessing the performance of the implemented safeguards and management measures ▪ Specify the equipment restrictions that would be implemented at night if night works required ▪ Describe the respite periods that would be implemented ▪ Specify restrictions on allowing equipment, plant and traffic to idle on site ▪ Specify the avoidance of activities that would generate impulsive noise ▪ Ensure any potentially impacted receivers are informed ahead of any planned works taking place outside of the recommended standard hours for construction works ▪ Ensure noise at sensitive receivers is monitored ▪ Identify how the construction staging and program includes for monitoring at sensitive receivers ▪ Include a specific process for documenting and resolving issues and complaints. *Note: The CNVMP would be routinely updated in response to any changes in noise and vibration. Tool box talks would be used to communicate constructor obligations and responsibilities under the plan.*		
The potential for exceedance of the NMLs across the proposal footprint	Locate fixed plant as far from residences as possible and behind site structures	Construction contractors	Construction
Construction noise impacts	Working hours are to be restricted in accordance with the EPA Interim Construction Noise Guideline. Working hours are to be in accordance with: ▪ Between 7.00am and 6.00pm, Monday to Friday. ▪ Between 8.00am and 1.00pm Saturdays. ▪ No work or deliveries on Sunday and/or public holidays. If work is required to be undertaken outside normal work hours, the Contractor will need approval from the Principal. The Contractor is to provide enough information for the Principal to evaluate any potential noise impact from the proposed works.	Construction contractor	Construction
Construction noise impacts	Community and business notification would be done prior to works commencing outlining the nature of the works, work hours and contact number. Additional community and business notification would be done at least five days before works outside standard hours that has a potential to cause any noise impact.	Construction contractor / Sydney Zoo	Pre-construction/ construction
Construction noise impacts	Any required night time work predicted to exceed the noise management level should aim to not affect residences for more than two consecutive nights or where possible, more than six nights over a one month period.	Construction contractor / Sydney Zoo	Construction

Impact	Environmental safeguards	Responsibility	Timing
Traffic, parking and access			
Construction traffic impacts	A construction traffic management plan (CTMP) would be prepared as a sub-plan of the CEMP. As a minimum, the plan would include the following controls: ▪ minimise use of heavy vehicles on local roads ▪ restrict deliveries to outside of peak traffic periods where possible ▪ ensure emergency vehicle access is maintained, including consultation with ▪ emergency services ▪ identify haulage routes and minimise impacts on local routes ▪ provide warning and advisory signage ▪ providing safe access points to work areas from the adjacent road network ▪ safety barriers where necessary ▪ maintaining adequate sight distance ▪ displaying prominent warning signage ▪ covering truck loads ▪ avoiding vehicle idling ▪ deliveries planned to minimise the number of trucks arriving at site at one time. ▪ materials delivered and spoil removed from the site during standard construction hours. ▪ use of Traffic Controllers to ensure safe vehicle and pedestrian movements for example when trucks enter or leave the site ▪ a Driver Code of Conduct plan ▪ Provide for local community consultation and notification of local road network and traffic impacts	Construction contractor	Pre-construction/ Construction
Operational traffic impacts	An operational transport management plan (OTMP) would be prepared which would investigate the potential of the following: ▪ online booking systems, with allocated visiting periods and staggered timing ▪ off-peak ticketing price reductions ▪ promotion of access via the M7 Motorway ▪ promotion of arrivals via public transport ▪ promotion of car pooling ▪ combined tour packages with other tourist destinations ▪ potential for additional regular route bus services and direct shuttle bus services between Blacktown Railway Station and the site (subject to further consultation with TfNSW) ▪ promotion of school tours during off-peak periods ▪ preparation of a Work Place Travel Plan to minimise staff travel by private car ▪ preparation of a Transport Access Guide for visitors	Sydney Zoo	Operation

Impact	Environmental safeguards	Responsibility	Timing
	▪ extended opening hours, particularly during peak periods to flatten out the peak		
Initial opening traffic impacts	An initial opening period transport management plan will be prepared with considering for the peak opening period and specific opening events which would be expected to have different traffic generating impacts compared to normal operation.	Sydney Zoo	Operation
Water, drainage and stormwater			
Sediment-laden run off and associated water quality impacts management	Prepare a Soil and Water Management Plan as part of the CEMP and address the following: ▪ The NSW Soils and Construction – Managing Urban Stormwater Volume 1 'the Blue Book' (Landcom, 2004) and Volume 2 (DECC, 2008) Detail the following as a minimum: ▪ Identification of catchment and sub-catchment areas, high risk areas and sensitive areas ▪ Sizing of each of the above areas and catchment ▪ The likely volume of run-off from each road sub-catchment ▪ Direction of flow of on-site and off-site water ▪ Separation of on-site and off-site water ▪ The direction of run-off and drainage points during each stage of construction ▪ Dewatering plan which includes process for monitoring, flocculating and dewatering water from site (i.e. formation or excavations) ▪ A mapped plan identifying the above ▪ Include progressive site specific Erosion and Sedimentation Control Plans (ESCPs). The ESCP is to be updated at least fortnightly ▪ A process to routinely monitor the Bureau of Meteorology weather forecast ▪ Preparation of a wet weather (rain event) plan which includes a process for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather. These controls are to be shown on the ESCPs ▪ Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.	Construction contractor	Pre-construction/ construction
On-site sediment and waste laden run off and associated water quality impacts during construction	▪ Erosion and sediment control measures would be implemented to ensure no sediment leaves the site. ▪ All waste materials (such as demolition materials) would be contained to prevent possible run off prior to removal from the site.	Construction contractor	Construction
Accidental spillage and associated water quality impacts	Maintain emergency spill kits on-site at all times and make all staff aware of the location of the spill kits and trained in their use.	Construction contractor	Construction
Fuel storage and refuelling	▪ All fuels, chemicals, and liquids would be in an impervious bunded area within the compound site. ▪ The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas within the compound site.	Construction contractor	Construction
Machinery maintenance checks	Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Erosion risk	▪ Disturbed surfaces would be reinstated as soon as possible. ▪ Erosion and sedimentation control measures would not be removed until disturbed areas have stabilised. ▪ Any damage from construction to the ground surface shall be restored to pre-construction condition on completion of works.	Construction contractor	Construction
Aboriginal heritage			
Potential heritage and archaeological impacts - general	Develop an Aboriginal Cultural Heritage Assessment Report (ACHAR). It would be within the CEMP. As a minimum, the plan would: ▪ map locations of known and potential sites of heritage and archaeological value do ▪ identify high-risk and no-go zones ▪ identify potential environmental risks and impacts due to the proposed work ▪ identify appropriate safeguards and management measures to minimise potential risk ▪ identify appropriate safeguards and management measures to avoid the risk of harm ▪ implement appropriate safeguards and management measures to protect heritage items and potential archaeological assets	Construction contractor	Pre-construction
Heritage induction training to cover all works across the site	▪ Provide Aboriginal heritage awareness training to the construction workforce prior to starting on site which would include: – guidelines to follow if unanticipated heritage items or deposits are located during works – the procedure for managing any unexpected find, discovering human remains, or unearthing other archaeological remains. ▪ Provide the Aboriginal heritage awareness training to any person or visitor to the site during construction	Construction contractor	Construction
Unexpected finds discovery across the site	▪ If unexpected finds are discovered during the proposed works, immediately cease all works within 10 metres of discovering an unexpected find (e.g. archaeological remains, heritage item, and potential relic). ▪ Engage a heritage consultant to assess the find and the NSW Heritage Division would be notified of the discovery of a relic in accordance with Section 146 of the NSW *Heritage Act 1977*	Construction contractor	Construction
Human remains discovery across the site	Handle human remains under the same process as an unexpected finds discovery; however, prior to the archaeologist recording the find contact the NSW Police, the OEH environment line and the OEH anthropologist.	Construction contractor	Construction
Non-Aboriginal heritage			
Potential heritage and archaeological impacts - general	Develop a non-Aboriginal heritage management plan (NAHMP). It would be a sub-plan of the CEMP. As a minimum, the plan would: ▪ map locations of known and potential sites of heritage and archaeological value do ▪ identify high-risk and no-go zones ▪ identify potential environmental risks and impacts due to the proposed work ▪ identify appropriate safeguards and management measures to minimise potential risk	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	▪ identify appropriate safeguards and management measures to avoid the risk of harm ▪ implement appropriate safeguards and management measures to protect heritage items and potential archaeological assets		
Heritage induction training to cover all works across the site	▪ Provide non-Aboriginal heritage awareness training to the construction workforce prior to starting on site which would include: – the location of heritage items outside the study area, including the extant gate entrance for the former OTC transmission station – guidelines to follow if unanticipated heritage items or deposits are located during works – the procedure for managing any unexpected find, discovering human remains, or unearthing other archaeological remains. ▪ Provide the non-Aboriginal heritage awareness training to any person or visitor to the site during construction	Construction contractor	Construction
Unexpected finds discovery across the site	▪ If unexpected archaeological finds are discovered during the proposed works, immediately cease all works within 10 metres of discovering an unexpected find (e.g. archaeological remains, heritage item, and potential relic). ▪ Engage a heritage consultant to assess the find and the NSW Heritage Division would be notified of the discovery of a relic in accordance with Section 146 of the NSW *Heritage Act 1977*	Construction contractor	Construction
Human remains discovery across the site	Handle human remains under the same process as an unexpected finds discovery; however, prior to the archaeologist recording the find contact the NSW Police, the OEH environment line and the OEH anthropologist.	Construction contractor	Construction
Waste management			
Waste generation during construction	Classify, handle and store all removed waste in the construction compounds/laydown areas in accordance with the NSW Waste Classification Guidelines 2009: Part 1 Classifying Waste (DECCW) and Storing and Handling liquids, Environmental Protection (DECC, 2007).	Construction contractor	Construction / Operation
Waste and resource management during construction across the proposal	Prepare a waste and resource management plan (WRMP) as a sub-plan of the CEMP. As a minimum describe the measures for handling, storing and classifying waste when 'onsite' and its subsequent disposal offsite to the relevant licenced facility.	Construction contractor	Construction / Operation
Waste disposal during construction across the proposal	Send all disposed materials to a suitably licenced waste management/landfill facility.	Construction contractor	Construction / Operation
Waste handling and storage during construction across the proposal	Store and segregate all waste at source (e.g. the construction compounds/laydown areas) in accordance with its classification. This includes recycled and reusable materials.	Construction contractor	Construction / Operation
Littering and site tidiness during construction across the proposal footprint	Monitor for waste accumulation, littering and general tidiness during routine site inspections.	Construction contractor	Construction / Operation
Resource recovery during construction across the proposal	Apply resource recovery principles: ▪ Reuse proposal-generated waste materials onsite (e.g. topsoil, recycled aggregate) providing it meets with exemption and classification requirements	Construction contractor	Construction / Operation

Impact	Environmental safeguards	Responsibility	Timing
	▪ Failing that, transfer the materials for use elsewhere on another site under a resource recovery exemption ▪ Employ waste segregation to allow paper, plastic, glass, metal and other material recycling. These materials could be either reused onsite or transferred to a recycling facility ▪ Consider composting general putrescible waste to allow recovery. Transfer these materials offsite to a composting facility.		
Reducing primary resource demand during construction across the proposal	Use recycled and low embodied energy products to reduce primary resource demand in instances where the materials are cost and performance competitive (e.g. where quality control specifications allow).	Construction contractor	Construction / Operation
Landscape character and visual impact			
Management of the construction works to minimise their visual impacts on nearby streetscape character	▪ Implement a maintenance schedule to ensure the entry to the Parklands from the Great Western Highway remains clear and tidy ▪ Consider screening methods to reduce the visual impact of the work site	Construction contractor	Construction
Light spill impacts during construction across the proposal footprint	▪ Screen, shield and cut-off all temporary site lighting to prevent light spill where possible ▪ Use directional light sources where possible to reduce lateral light spill ▪ Use low luminescence lighting lights where feasible to reduce the lateral light spill ▪ Shield the top of all site lighting to prevent any upward light glare ▪ Remove any lighting conflict with the general street lighting to prevent the risk of motorists becoming disorientated or distracted	Construction contractor	Construction
Operational light spill impacts on adjacent properties	▪ Follow the lighting design specification that aims to ensure any the height and direction of any lighting pole would not introduce sky glow or impacts on neighbouring residential properties or road users of the Great Western Highway ▪ Use directional lighting fixtures with cut-offs and filters as required	Construction contractor/ Sydney Zoo	Detailed design/ Pre-construction
Vegetation and biodiversity			
Biodiversity management across the entire proposal footprint	Prepare a biodiversity management plan (BMP) as a sub-plan of the CEMP. As a minimum, the plan would: ▪ Provide for the discovery of unexpected threatened flora or fauna. ▪ Provide for contractor staff training to be aware of the sensitivity of the surrounding environment including threatened ecological communities ▪ Identify impact areas and measures for clearly delineating these areas, using fences or similar means to prevent encroachment of the works into the surrounding bushland.	Construction contractor	Pre-construction
Biodiversity management across the entire proposal footprint	▪ Vegetation / woody debris for removal should be used in adjacent areas for habitat features or mulched for soil erosion control. ▪ Work in riparian zones (i.e. areas of River Flat Eucalypt Forest) would be undertaken to limit impacts on aquatic flora and fauna, and their habitats. This would include measures to preventing run-off into the adjacent vegetation and creek and clearly delineating the construction area boundaries.	Construction contractor	Construction
Noxious weed management	▪ Areas proposed for disturbance where noxious weeds are present should be managed according to the weed class.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	▪ Soil containing seeds from exotic grass species should be removed from the site as soon as practicable and / or stored appropriately to prevent their spread. ▪ Wash down machinery before entering the site to limit weed spread.		
Biodiversity impacts on watercourses and drainage lines	▪ Construction adjacent to drainage lines should be completed during dry periods. ▪ Storage areas should be located away from the drainage lines to minimise risk of pollution and adverse impact to aquatic ecosystems. Installation of sediment and runoff control measures to prevent runoff entering adjacent bushland areas and watercourses. ▪ Potential chemical pollutants (e.g. fuels, oils, lubricants, paints etc.) would be stored in appropriate containers within bunded areas within construction compounds to minimise the risk of the pollution of aquatic environments.	Construction contractor	Construction
Loss of hollow bearing trees	▪ As a precautionary measure ensure a qualified ecologist would be present during the felling/pruning of any identified hollow-bearing trees to manage wildlife that may be disturbed and/or injured. *The ecologist would assess the species and then release them to the nearest suitable habitat if uninjured.*	Construction contractor Sydney Zoo	Construction
Impacts on non-listed species across the entire construction site	▪ As a precautionary measure close-off all excavations overnight, in locations where night works are not planned, to prevent animals becoming trapped ▪ Inspect each excavation prior to the works starting in the morning ▪ Have a designated qualified person that would capture any inadvertently trapped species and release the species into the nearest suitable habitat if uninjured If construction lighting is required at night direct light beams away from vegetative areas to protect microbats.	Construction contractor	Construction
Loss of habitat for fauna from clearance	▪ Direct seed with native provenance grass seeds or sterile grasses on exposed areas. Retention of fallen logs and relocation to adjacent areas where possible to provide habitat resources for ground-dwelling species.	Construction contractor Sydney Zoo	Construction
Operational biodiversity management	▪ Prevention of runoff and wastewater from the zoo entering the adjacent watercourse through the implementation of a constructed wetlands and harvesting pond in the west of the site ▪ Ongoing weed control should be undertaken along the length of the works to reduce the impacts of edge effects on adjacent vegetation.	Sydney Zoo	Operation
Bushfire			
Bushfire management - general	Implement appropriate hazard reduction program in consultation with Western Sydney Parklands and Cumberland Zone Rural Fire Service where woodland vegetation is within or above threshold.	Sydney Zoo	Operation
Bushfire management during operation	Maintain access roads and tracks within the site and consider the following ongoing management of any buildings and landscaped areas: ▪ Removal of combustible material, particularly litter in gutters, near buildings. ▪ Removing excess amounts of fuel from garden areas (including organic mulch). ▪ Ensuring garden plantings do not overhang any buildings, tree canopies are discontinuous, and shrubs are not	Sydney Zoo	Operation

Impact	Environmental safeguards	Responsibility	Timing
	positioned within two metres of buildings.		
Operational Bushfire Management Plan	Prepare a Bushfire Emergency Management Plan outlining evacuation routes, firefighting protocols and hydrant locations.	Sydney Zoo	Operation
Hazards and risk			
Construction hazard and risk management across the proposal	Prepare a hazard and risk management plan (HRMP) as a sub-plan of the CEMP. As a minimum, the plan would: ▪ Include an emergency response plan ▪ Be prepared by a suitably qualified hazard management specialist ▪ Provide for the implementation, monitoring and maintenance of the identified hazard controls.	Construction contractor	Pre-construction
Accidental spillage and discharge across the proposal during construction	▪ Keep wet and dry spill kit, sand-filled/gravel-filled socks and geotextile matting 'onsite' at all times. ▪ Train staff in the appropriate deployment, use, removal and disposal of spill kit.	Construction contractor	Construction
Workforce and public safety during construction across the proposal	Fence off and secure the site to prevent public access.	Construction contractor	Construction
Workforce and public safety during construction across the proposal	▪ Use terracing excavation methods where applicable. ▪ Backfill or cover all open excavations with boards/plates outside of working hours.	Construction contractor	Construction
Workforce and public safety during construction across the proposal	Inspect the entry connection into the Parkland Access Road ahead of any required demobilisation to ensure there are no road-user or pedestrian hazards.	Construction contractor	Construction
Hazardous material and dangerous goods transportation to the construction site during construction	Handle and use dangerous goods and hazardous materials in accordance with: the NSW *Occupational Health and Safety Act 2000*; the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008).	Construction contractor	Construction
Utility or services strike across the proposal during construction	Undertake detailed utility surveys as part of the detailed design along with utility-provider consultation.	Construction contractor Sydney Zoo	Construction
Utility or services strike across the proposal during construction	Prepare and work to a utility and services plan. No work would take place outside of this plan without additional consultation and utility searches.	Construction contractor	Construction
Hazardous material and dangerous goods transportation and storage across the site during operation	Handle, store and use dangerous goods and hazardous materials in accordance with: the NSW *Occupational Health and Safety Act 2000*; the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005); NSW Road and Rail Transport (Dangerous Goods) (Road) Regulation 1998; and Australian Government's Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2008).	Sydney Zoo	Operation
Hazardous material and dangerous goods storage during operation	Hazardous materials and dangerous goods will be store within a bunded and secure storage facility on-site.	Sydney Zoo	Operation

Impact	Environmental safeguards	Responsibility	Timing
Driver safety across the proposal during operation	Incorporate car park signage to indicate direction of travel and traffic calming devices including speed humps and speed limits,	Sydney Zoo	Detailed design/Operation
Ecologically sustainable development			
Energy efficiency measures during operation	▪ Investigate opportunities for alternate energy provision after an initial review period of operation	Sydney Zoo	Operation
Building performance during operation	▪ Prepare a Section J energy efficiency assessment of the main buildings during the detailed design stage to determine possible energy saving measures	Sydney Zoo	Detailed design
Water usage	▪ Implement water efficient fittings and fixtures into building design	Sydney Zoo	Detailed design
Transport during operation	▪ Promote the use of public transport for patrons and staff ▪ Prepare an OTMP as outlined in Section 6.3.3	Sydney Zoo	Operation
Greenhouse gas emissions during construction	▪ Recycle or compost waste were possible ▪ Choose nearby sources of fill and other building materials to reduce transport emissions ▪ Ensure construction plant is regularly maintained to ensure optimum fuel efficiency ▪ Where possible, operate construction plant at lower power settings to conserve fuel, and switch off engines when not in use ▪ Plan construction activities to avoid double handling of fill and other materials.	Construction contractor	Construction
Greenhouse gas emissions during operation	▪ Utilise energy efficient building design features such as natural ventilation and lighting, and insulation ▪ Consider on-site renewable energy, such as solar power ▪ Investigate the feasibility of using electric powered mobile plant on site.	Sydney Zoo	Operation

9.0 Justification of the Proposal

In general, investment in major projects can only be justified if the benefits of doing so exceed the costs. Such an assessment must consider all costs and benefits, and not simply those that can be easily quantified. As a result, the EP&A Act specifies that such a justification must be made having regard to biophysical, economic and social considerations and the principles of ecologically sustainable development.

This means that the decision on whether a project can proceed or not needs to be made in the full knowledge of its effects, both positive and negative, whether those impacts can be quantified or not.

The proposed development involves the development of a zoological facility. The assessment must therefore focus on the identification and appraisal of the effects of the proposed change over the site's existing condition.

Various components of the biophysical, social and economic environments have been examined in this EIS and are summarised below.

9.1 Social and Economic

The Zoo proposes to participate in international breeding and conservation programs, with current discussions underway with the Australian Wildlife Conservancy to form an alliance to begin the preparation of a suitable conservation program.

These conservation programs will feed into the educational framework the Zoo is seeking to focus on. The Zoo will provide educational opportunities for the growing population of Western Sydney, which currently suffers from a lack of easy access to such offerings, particularly at the scale proposed by Sydney Zoo. This is due to Taronga Zoo being located over 35km to the east, and limiting the opportunity for the Western Sydney population to participate more fully in these programs.

It has been estimated that the annual impact on the wider NSW economy will be approximately $45m, which equates to about 160 incremental full time person years of employment. The operation of the Zoo is anticipated to generate an on-going impact of between 120 jobs (base) and 210 jobs (high) per annum.

9.2 Biophysical

This assessment has found that while there may be impacts as a result of the proposal, they are not considered to be of sufficient significance, either in nature or extent as to be regarded as unacceptable. On balance, the beneficial outcomes that would arise from the proposal substantially outweigh any negative impacts that may arise and mitigation and management measures detailed in this EIS and its appended technical reports would ameliorate or minimise any expected impacts.

The proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The proposal is also unlikely to affect Commonwealth land, or have a significant impact on any matters of national environmental significance and therefore a referral to the Australian Minister for Environment is not required.

9.3 Ecologically Sustainable Development

The EP&A Regulation lists 4 principles of ecologically sustainable development to be considered in assessing a project. They are:

- The precautionary principle;
- Intergenerational equity;
- Conservation of biological diversity and ecological integrity; and
- Improved valuation and pricing of environmental resources.

An analysis of these principles follows.

Precautionary Principle

The precautionary principle is utilised when uncertainty exists about potential environmental impacts. It provides 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. The precautionary principle requires careful evaluation of potential environmental impacts in order to avoid, wherever practicable, serious or irreversible damage to the environment.

This EIS has not identified any serious threat of irreversible damage to the environment and therefore the precautionary principle is not relevant to the proposal.

Intergenerational Equity

Inter-generational equity is concerned with ensuring that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. The proposal has been designed to benefit both the existing and future generations by:

- implementing safeguards and management measures to protect environmental values.
- facilitating job creation and the provision of housing in close proximity to public transport; and
- Improving the public domain and amenity in the precinct.

The proposal has integrated short and long-term social, financial and environmental considerations so that any foreseeable impacts are not left to be addressed by future generations. Issues with potential long term implications such as waste disposal would be avoided and/or minimised through construction planning and the application of safeguards and management measures described in this EIS and the appended technical reports.

Conservation of biological diversity and ecological integrity

The principle of biological diversity upholds that the conservation of biological diversity and ecological integrity should be a fundamental consideration.

The proposal would not have any significant effect on the biological diversity and ecological integrity of the site. The proposed safeguards and mitigation measures prepared as part of this EIS and appended technical reports provide for management of the identified potential impacts.

Improved valuation, pricing and incentive mechanisms

The principles of improved valuation and pricing of environmental resources requires consideration of all environmental resources which may be affected by a proposal, including air, water, land and living things. Mitigation measures for avoiding, reusing, recycling and managing waste during construction and operation would be implemented to ensure resources are used responsibly in the first instance.

Additional measures will be implemented to ensure no environmental resources in the locality are adversely impacted during the construction or operational phases.

10.0 Conclusion

This Environmental Impact Statement (EIS) has been prepared to consider the environmental, social and economic impacts of the proposed Sydney Zoo. The EIS has addressed the issues outlined in the Secretary's Environmental Assessment Requirements (**Appendix D**) and accords with Schedule 2 of the EP&A Regulation as required for the submission of this SSD application.

Having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development, the carrying out of the project is justified for the following reasons:

- The proposed Zoo introduces a new destination tourist and recreational attraction into the Western Sydney area;
- The Sydney Zoo will provide for employment and educational opportunities;
- The Zoo is in accordance with the Western Sydney Parklands Plan of Management which identifies the Bungarribee Super Park as suitable for a tourist and commercial hub;
- The masterplan retains areas of biological importance and proposes landscaping and vegetation planting to ensure a contiguous connection with the wider Western Sydney Parklands area; and
- The Zoo will maintain exceptional standards of animal welfare as required under the EAP Act and participate within conservation programs to ensure the intergenerational wellbeing of native and exotic flora and fauna species.

Given the merits described above it is requested that the application be approved.

11.0 Acronyms and Abbreviations

AASA	Aboriginal Archaeological Survey Assessment
ACHAR	Aboriginal Cultural Heritage Assessment Report
AHIMS	Aboriginal Heritage Information Management System
AWS	automatic weather station
BOM	Bureau of Meteorology
CBD	Central Business District
CEEC	Critically Endangered Ecological Community
CEMP	construction environmental management plan
CLT	cross laminated timber
CNVMP	construction noise and vibration management plan
CTMP	construction traffic management plan
dBA	A-weighted decibels
DD Act	*Disability Discrimination Act 1992*
DPI	NSW Department of Primary Industries
DoS	Degree of Saturation
EP	equivalent persons
EP&A Act	*Environmental Protection and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
EAP Act	*Exhibited Animals Protection Act 1986*
EIS	Environmental Impact Statement
ENM	excavated natural material
EPA	Environmental Protection Agency
ERA	Environmental Risk Assessment
ESD	environmentally sustainable development
Featherdale	Featherdale Wildlife Park
ha	hectare
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	NSW EPAs Interim Construction Noise Guidelines
INP	NSW Industrial Noise Policy
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LoS	Level of Service
NAHMP	non-Aboriginal heritage management plan
NMLs	noise management levels
OEH	NSW Office of Environment and Heritage
OTC	Overseas Telecommunications Commission
OTMP	operational transport management plan
OU	odour units
PAC	packaged air conditioner units
PAD	Potential Archaeological Deposit
$PM_{2.5}$	particulate matter $\leq$2.5µm
PM_{10}	particulate matter with a diameter of less than 10 or equal to a nominal 10 micrometres
RBL	Rating Background Noise Level
RNP	NSW Road Noise Policy
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP33	State Environmental Planning Policy No 33—Hazardous and Offensive Development
SEPP64	State Environmental Planning Policy No 64—Advertising and Signage
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2011
SSD	State Significant Development
TfNSW	Transport for NSW

TSP	total suspended particles
VENM	virgin extracted natural material
VOC	volatile organic compound
VRF	variable refrigerant control
WMP	Waste Management Plan
WSPT	Western Sydney Parklands Trust
WWS	Wet'n'Wild Sydney