



APPENDIX D MITIGATION MEASURES AND ENVIRONMENTAL RISK ASSESSMENT

SSD-17483577 – TARONGA REPTILE AND AMPHIBIAN CONSERVATION CENTRE

The following section provides recommendation for mitigation measures in response to potential impacts identified in Section 6 of this report. The structure of mitigation measures is based on the DPIE's hierarchy of approaches for managing impacts identified in the *Draft Environmental Impact Assessment Guidance Series* released by DPE in June 2017, as:

- **Performance based measure** – identify performance criteria that must be complied with to achieve an appropriate environmental outcome but do not specify how the outcome is to be achieved.
- **Prescriptive measure** – require action to be taken or specify something that must not be done.
- **Management based measure** – identify one or more management objectives that must be achieved through the implementation of a management plan.

Following the implementation of appropriate mitigation measures as recommended, it is determined that the proposal will not result in any significant adverse impacts on the surrounding environment. The following table illustrates how the matters raised within the SEARs and CIP Conditions will be addressed.

This analysis comprises a qualitative assessment consistent with AS/NZS ISO 31000:2009 *Risk Management–Principles and Guidelines* (Standards Australia 2009). The level of risk was assessed by considering the potential impacts of the proposed development prior to application of any mitigation or management measures. In accordance with the SEARs, the Environmental Risk Assessment (**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.

Risk comprises the likelihood of an event occurring and the consequences of that event. For the proposal, the following descriptors were adopted for 'likelihood' and 'consequence'.

Likelihood		Consequence	
A	Almost certain	1	Widespread and/or irreversible impact
B	Likely	2	Extensive but reversible (within 2 years) impact or irreversible local impact
C	Possible	3	Local, acceptable or reversible impact
D	Unlikely	4	Local, reversible, short term (<3 months) impact
E	Rare	5	Local, reversible, short term (<1 month) impact

The risk levels for likely and potential impacts were derived using the following risk matrix.

		LIKELIHOOD				
		A	B	C	D	E
CONSEQUENCE	1	High	High	Medium	Low	Very low
	2	High	High	Medium	Low	Very low
	3	Medium	Medium	Medium	Low	Very low
	4	Low	Low	Low	Low	Very low
	5	Very low	Very low	Very low	Very low	Very low

The results of the environmental risk assessment for the proposed development are presented in the below table and are based upon the range of technical and specialist consultant reports appended to the EIS. The table has directly related mitigation measures responding to each impact also based upon the range of technical and specialist consultant reports appended to the EIS.

N.B. 'O' – Operational; 'C' – Construction

'Pe' – Performance based mitigation measure; 'Pr' – Prescriptive based mitigation measure 'Ma' – Management based mitigation measure

SEAR	Potential Impact	Stage of Project	Likelihood	Consequence	Risk Level	Approach	Mitigation Measure (Pe/Pr/Ma)	Residual Impact
Built Form, Urban Design and Visual Impacts	Built form scale and appearance will be readily visible when viewed from Sydney Harbour and other key public vantage points.	O	D	3	Low	The overall built form has been designed to reduce any potential visual impacts and remains within the tree canopy of the Zoo and are not visible from Sydney Harbour.	Pe	The proposed buildings and structures remain within the tree canopy of the Zoo and are not visible from the three identified view points in Sydney Harbour.
Heritage	Adverse impact on the heritage significance of the site Adverse impact on the heritage significance of the locality Damage to archaeological relics	C & O	C	2	Medium	<p>During construction:</p> <p>Ensure appropriate protection for all built and landscape elements proposed for retention in proximity to any building works as part of the construction phase.</p> <p>Before building works commence on site, ensure appropriate archival recording of the large rock outcrops (Item 75L) proposed for salvage and relocation.</p> <p>Ensure qualified arboricultural advice is sought before excavating within the canopies/ root zone of the Waterhousea Avenue for footings or road surface replacement.</p> <p>Update the Taronga Zoo s170 register to reflect those items that have been relocated or at not in the location specified in the Register.</p> <p>For proposed surface disturbance within the south-western portion of the subject area and interior of the extant aviary walls, close monitoring should be undertaken by a suitably qualified archaeologist.</p> <p>For proposed surface disturbance, including excavation for the RACC and landscaping works throughout the remainder of the subject area, a Chance Finds Procedure should be implemented.</p> <p>Although considered highly unlikely, should any Aboriginal objects, archaeological deposits be uncovered during any site works, a Chance Find Procedure must be implemented.</p> <p>n the unlikely event that human remains are uncovered during any site works, a Human Remains Procedure must be implemented.</p>	Ma	All works are respectful of the significance of Taronga Zoo.

SEAR	Potential Impact	Stage of Project	Likelihood	Consequence	Risk Level	Approach	Mitigation Measure (Pe/Pr/Ma)	Residual Impact
Traffic & Transport	Impacts on road network from construction and operational phase Additional demand on car parking spaces.	C & O	D	4	Low	Traffic control would be required to manage and regulate construction vehicle traffic movements to and from the Site during construction.	Pe	Management of traffic and transport impacts specifically during the construction phase and ongoing operation.
Noise	Adverse noise generation during construction on surrounding neighbours	C	C	3	Low	<p>The following project-specific mitigation measures are recommended during construction:</p> <p>Ensure that construction work including general demolition, site preparation, bulk earthworks, construction and construction-related activities is restricted to the stated normal working hours with high noise-generating activities scheduled to be undertaken when background noise, including local road traffic, is high to provide masking to construction noise.</p> <p>Inform surrounding neighbours ahead of time of the intended scope of works regarding noise.</p> <p>Excavating of rock, and the use of jack-hammers, pile-drivers, vibration rollers/compactors or the like is to occur on weekdays where practicable or at intervals during the day.</p> <p>Where practical, earth mounds or screening will be constructed in sensitive locations, to act as acoustical barriers and to minimize noise emissions.</p> <p>The Contractor shall monitor noise and vibration objectively of plant and sensitive receptors. The results of these tests shall be recorded on a regular basis.</p>		Management of noise impacts on surrounding noise sensitive receivers specifically during the construction phase
Water, Drainage and Stormwater	Adverse impact on the quality of stormwater runoff Adverse impact on ground water quality	O	D	2	Low	Stormwater treatment devices should be incorporated in the design to manage surface runoff with additional treatment incorporated into the existing stormwater system.	Pr	
Construction Impacts	Adverse construction impacts on animals and neighbouring properties	C	C	3	Medium	<p>Keep staff and visitors informed of construction works with flyers and notice board.</p> <p>Provide alternative routes for pedestrians.</p> <p>Environmental impact measures to be employed (dust suppression for concrete items). This includes ensuring any dust caused by the works is reduced to a minimum. Areas worked in by Contractors will be adequately screened to prevent dust spreading to neighbouring buildings via the installation of pre filters.</p>		Impacts on the amenity of neighbouring properties.

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						<p>Limit use of heavy breakers with respite periods.</p> <p>All works carried out in daytime work hours.</p> <p>Deliveries to the site will be carried out in accordance with the work hours as approved by the development consent approvals and Traffic Management Plan.</p>		
Biodiversity	Unnecessary removal or damage to the TEC's or other retained vegetation	C	D	3	Low	<p>Prior to construction, develop a Construction Environmental Management Plan (CEMP) with relevant mitigation measures to ameliorate potential impacts to biodiversity values outside of the development area. The CEMP should include:</p> <ul style="list-style-type: none"> ▪ Sediment and Erosion Control ▪ Tree Protection ▪ Stormwater management 	Pe	Unnecessary damage to trees to be retained
Landscaping and tree removal	Construction impacts on retained trees at the site.	C	C	3	Medium	<p>Specific mitigation measures to protect the remaining trees within and around the development area are outlined below:</p> <p>A site-specific tree protection plan should form part of the final Construction Management Plan detailing the location of tree protection fencing, inspection and reporting protocols and any areas where ground protection will be required.</p> <p>All pruning must be conducted in accordance with AS4373-2007- The Pruning of Amenity Trees.</p> <p>No underground services are to be located within the TPZ or SRZ of any tree to be retained.</p> <p>All tree protection measures must be undertaken in accordance with the relevant Australian Standards.</p>	Pe	Loss of existing landscape and highly significant trees
Noise & Vibration	Construction noise	C	C	3	Medium	<p>Avoiding the coincidence of noisy plant working simultaneously close together would result in reduced noise emissions.</p> <p>Equipment which is used intermittently is to be shut down when not in use.</p> <p>Where possible, equipment with directional noise emissions should be oriented away from sensitive receivers.</p> <p>Regular compliance checks on the noise emissions of all plant and machinery used for the proposal would</p>	Pe	Disturbance to local amenity, including proximal sensitive receivers. Given the high level of construction within the precinct, cumulative impact from construction remains a concern.

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						<p>indicate whether noise emissions from plant items were higher than predicted.</p> <p>Where possible, heavy vehicle movements should be limited to standard construction hours; and</p> <p>Non-tonal reversing alarms should be used on all items of plants and heavy vehicles used for construction.</p>		
	Operational noise	O	C	4	Low	<p>Relocating heavy vehicle access routes away from the site boundary, taking advantage of screening afforded by the building envelope.</p> <p>Reducing peak 15-minute heavy vehicle movements across the development by staggering delivery/pickup times.</p> <p>Reducing peak 15-minute light vehicle movements across the development by staggering shift change times for employees.</p> <p>Minimising the concurrent use of forklifts and other mobile plant outside the warehouses (ie in the hardstand areas) and/or limiting their use to the less sensitive daytime and evening periods.</p> <p>The use of quieter mobile plant options, such as electric forklifts instead of gas-powered forklifts.</p> <p>Locating fixed mechanical plant away from the most-affected sensitive receivers, such as ground level locations instead of rooftop locations, and/or shielded behind the warehouse/office structures.</p> <p>The use of quieter fixed mechanical plant options, noting that this assessment assumes an indicative noise level for modelled mechanical plant.</p> <p>Acoustic screening, no less than 500 mm higher than the top of the plant, located as close as practicable to the plant.</p> <p>Best management practice – such as switching vehicles and plant off when not in use, education of staff and drivers regarding noise impacts, regular maintenance of plant and equipment to minimise noise emissions, use of silent or non-tonal reverse alarms instead of tonal alarms, minimising use of reverse alarms by providing forward manoeuvring where practicable.</p>	Pr	Risk of disturbance from cumulative operational impact with multiple tenants operating logistics facilities that has the potential to cause impact to nearby sensitive receivers.

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Aboriginal Archaeology	Disturbance to sub-surface objects and artefacts.	C	C	2	Medium	An Archaeological Research Design & Methodology is to be prepared for the sub-surface investigation of the identified landscape features and their potential for retaining Aboriginal objects and archaeological resources.	Pr	Potential destruction of sub-surface objects are artefacts that have cultural value.
	Construction workers/ contractors inappropriately handling or destroying potential artefacts or items of significance.	C	C	2	Medium	Induction materials be prepared for inclusion in site inductions for any contractors working at the subject area.	Pr	A lack of education awareness could result in a contractor not following the correct procedure when finding a potential artefact or item of significance.
	A recovered item is not respectfully handled upon being found on site.	C	D	2	Low	Aboriginal objects recovered from the test excavation program will be reburied within the study area, outside the proposed impact area.	Pe	A recovered item is not respectfully reburied on site in line with the methodology as presented in the ACHA.
Bushfire	Impact to the proposed development by threat of bushfire.	O	D	4	Low	An emergency evacuation plan is to be prepared for the site. All hazardous materials and gas infrastructure is to be appropriately located from fire hazard.	Ma	Potential damage to life and property as a result of threat from bushfire and inappropriate mitigation measures.
Waste Management	Amassing of waste as a result of both construction and operation	C & O	C	4	Low	Practical building design and construction techniques, including construction staging and ordering pre-cut materials at the required sizes. Appropriate collection and subsequent reuse, recycling or treatment offsite for items such as batteries, cardboard, timber, plastic, glass etc. during construction, demolition and operational phases. Careful on-site storage, sorting and separation of different waste products, especially for waste appropriate for recycling and reuse. Returning certain waste products (e.g. packaging) to the suppliers where possible. Acquiring materials and goods from waste reducing sources (e.g., recycled materials, fit for purpose packaging, leased equipment and machinery). Other operational, waste reduction and management practices (e.g., provision of take back services to clients, flattening cardboard waste, recycle collection in offices and tearooms).	Pr	Threat of incorrect disposal of waste streams which have potential for environmental risk.

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						<p>Hiring of qualified contractors for handling waste removal properly informing sub-contractors of waste management procedures.</p> <p>Waste Storage and Management during the demolition, construction and operational phases is to be undertaken in accordance with the Waste Management Plan</p>		