

APPENDIX D - ENVIRONMENTAL RISK ASSESSMENT AND MITIGATION MEASURES

The following section provides recommendation for mitigation measures in response to potential impacts identified in **Section 6** of the EIS. 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 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

SEARS	Potential Impact	Stage of Project	Likelihood	Consequence	Risk Level	Approach	Mitigation Measure (Pe/Pr/Ma)	Residual Impact
Traffic and Transport	Impacts on road network from construction and operational phase.	C & O	D	4	Low	<ul style="list-style-type: none"> ▪ Manage and control construction traffic movements on the adjacent road network and vehicle movements to and from the site; ▪ Trucks to enter and exit the site in a forward direction; ▪ No provision of vehicle parking for construction workers; ▪ Restrict construction vehicle activity to designated truck routes; ▪ Construction access from the external road network to occur at signalised intersection; ▪ Pedestrian movements adjacent to demolition activity will be managed and controlled by site personnel where required; ▪ Pedestrian warning signs and construction safety signs/devices to be utilised in the vicinity of the site and to be provided in accordance with WorkCover requirements; ▪ Construction activity to be carried out in accordance with the approved hours of work; ▪ Truck loads would be covered during transportation off-site; ▪ Establishment and enforcement of appropriate on-site vehicle speed limits which would be reviewed depending on weather conditions or safety requirements; ▪ Activities related to the construction works would not impede traffic flow along local roads; ▪ Materials would be delivered and spoil removed during standard construction hours; ▪ Construction vehicles not to queue on adjacent roads and be wholly accommodated within the site or the nominated works zone; ▪ Minimal construction traffic movements to/from the site will be made during peak hours where practical to minimise the impact on the wider road network. <p><u>Operational Period</u></p> <ul style="list-style-type: none"> ▪ No car parking is to be provided as part of the proposal and therefore no additional traffic will be generated to impact light rail vehicles. ▪ No car parking is being provided as part of the development and therefore the traffic impact will be negligible, with the main traffic generation related to servicing and deliveries. ▪ The proposal integrates with the existing network of footpaths within the UNSW Kensington campus, with the building entry adjacent to Chancellery Walk. The building will provide for strong pedestrian connections to key destinations including the UNSW High Street light rail stop and will therefore provide no impact to pedestrian movements. ▪ The building has been designed to be well connected to the network of internal pedestrian pathways and provided for strong levels of passive surveillance to ensure no safety issues for pedestrians will occur. ▪ The existing loading dock servicing the Biological Sciences building will be able to accommodate the relatively small number of service and delivery vehicles generated by the proposal and therefore not generate additional demand for loading on the site. ▪ The Building E25 project benefits from having on-site end of trip areas as well as over 900 bicycle parking spaces on the UNSW Kensington campus and therefore there will be suitable bike parking available on the campus. 	Pr	Low
Noise and Vibration	Impacts of construction and operational activities to surrounding receivers	C, O	B	3	Medium	<p><u>Operation</u></p> <p>The rooftop generator proposed for the project will be required to incorporate the following mitigation measures:</p> <ul style="list-style-type: none"> ▪ Allowance for enclosure rated to achieve external noise emissions criteria ▪ Allowance for floating reinforced normal weight concrete deck below container on vibration isolation system. ▪ Rooftop acoustic screen up to 4m in height shall be constructed using materials with a minimum surface density of 25 kg/m² with part of the inside face lined using P50 Megasorber with water repellent Soundmesh G8 facing or acoustically equivalent material. <p><u>Construction</u></p> <ul style="list-style-type: none"> ▪ Prior to commencement of construction works and when details of construction methodology and equipment are available, a Construction Noise and Vibration Management Plan (CNVMP) is to be prepared and implemented in accordance with the requirements of the Interim Construction Noise Guideline. ▪ Avoiding any unnecessary noise when carrying out manual operations and when operating plant ▪ Ensuring spoil is placed and not dropped into awaiting trucks 	Pr	Low

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						<ul style="list-style-type: none"> ▪ Avoiding/limiting simultaneous operation of noisy plant in discernible range of a sensitive receiver where practicable ▪ Switching off any equipment not in use for extended periods e.g. Heavy vehicles engines would be switched off whilst being unloaded ▪ Restriction of heavy vehicle movements to and from the site to standard (daytime) hours where feasible and avoiding deliveries at night/evenings wherever practicable ▪ No idling of delivery trucks keeping truck drivers informed of designated routes, parking locations and acceptable delivery hours for the site compounds, refuelling areas and work areas designed to promote one-way traffic so that vehicle reversing movements are minimised. ▪ Minimising talking loudly; no swearing or unnecessary shouting, or loud stereos/radios onsite; no dropping of materials from height where practicable, no throwing of metal items and slamming of doors. ▪ Maximising offset distances between noisy plant and adjacent sensitive receivers and determining safe working distances using the most suitable equipment necessary for the construction works at any one time directing noise-emitting plant away from sensitive receivers ▪ Regularly inspecting and maintaining plant to avoid increased noise levels from rattling hatches, loose fittings etc ▪ Using non-tonal reversing/movement alarms such as broadband (non-tonal) alarms or ambient noise-sensing alarms for all plant used regularly onsite (greater than one day), and for any out of hours works ▪ Use of quieter and less vibration emitting construction methods where feasible and reasonable. ▪ The most applicable standard management measures are outlined as follows: <ul style="list-style-type: none"> – Construction hours and scheduling: – Works to generally be carried out during standard construction hours (i.e. 7 am to 6 pm Monday to Friday; 8 am to 1 pm Saturdays). ▪ Vibration monitoring: <ul style="list-style-type: none"> – To avoid structural impacts as a result of vibration or direct contact with structures, the proposed works would be undertaken in accordance with the safe work distances (refer to table 6.4) and attended vibration monitoring or vibration trials would be undertaken where these distances are required to be challenged. – Vibration resulting from construction and received at any structure outside of the project would be managed in accordance with: <ul style="list-style-type: none"> – For structural damage vibration - British standard bs 7385 part 2-1993 evaluation and measurement for vibration in buildings. – For human exposure to vibration the acceptable vibration - values set out in the environmental noise management assessing vibration: a technical guideline (department of environment and conservation, 2006) which includes British standard bs 6472:1992 guide to evaluation of human exposure to vibration in buildings (1 hz to 80 hz). <p>Property conditions surveys would be completed prior to any vibration intensive work being carried out at or within the minimum distances set out in this report. Minimum working distances to be confirmed prior to carrying out any vibration intensive work on site.</p>		
Flooding	Impact of development on flood paths.	C, O	E	5	Very low	<ul style="list-style-type: none"> ▪ Proposed civil grading as detailed on the engineering plans prepared by Mott MacDonald. ▪ Connection of local building rood runoff directly to inground pipe network as detailed on the engineering plans prepared by Mott MacDonald <p>During detailed design a site specific FERP to be developed for the E25 Biolink building to:</p> <ul style="list-style-type: none"> ▪ Provide clarity around the potential flooding conditions including that the E25 Biolink building is safe in all potential flood events, and ▪ Make clear that evacuation to only be considered if coordinated with wider campus emergency response plans for flooding, and <p>Limit evacuation efforts only to situations where sufficient warning is made available to occupants prior to the event occurring.</p>	Ma	Very Low
Hazard and Risk	Impact to human health with the presence of	C	C	4	Low	<p><u>Hazardous Materials Management Measures</u></p> <ul style="list-style-type: none"> ▪ Asbestos materials identified on site to be managed through the Asbestos Management Plan. 	Ma	Very Low

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	hazardous materials on the subject site.					<ul style="list-style-type: none"> ▪ Consideration to be given to the following remedial works by an appropriate licensed asbestos contractor as part of a planned program of works in accordance with NSW Work Health and Safety Regulation, 2017 and the SafeWork NSW Code of Practice How to Safely Remove Asbestos, 2022. Restrict access to these areas to authorised personnel only. ▪ Repair/seal the damaged areas to west wall in Room 259, which is the wall common to Room 261 & 262 on Level 2. ▪ Repair/seal the damaged areas to walls in Room 341, which are common to Room 340 on Level 3. ▪ Repair/seal the damaged areas to walls in Room 458 and 459, which are common to Room 458 on Level 4. ▪ Repair/seal the damaged areas to walls in Room 574, which are common to Room 573 on Level 5. <p><u>Hazardous Materials Management Measures Prior to the Commencement of Development</u></p> <ul style="list-style-type: none"> ▪ Further investigation and sampling to be undertaken to determine the presence and extent of asbestos containing sealant associated with the windows and façade joints; asbestos containing insulation associated with the façade spandrel panel brackets/elements, asbestos containing bituminous adhesive on the floor beneath floor coverings, asbestos containing membrane on the building roof area and also in shafts and wall cavities prior to refurbishment or demolition works. ▪ Remove asbestos materials prior to construction under controlled conditions by an appropriately licenced Asbestos Removal Contractor in accordance with NSW Work Health and Safety Regulation, 2017 and the SafeWork NSW Code of Practice How to Safely Remove Asbestos, 2022 if works are to impact the asbestos containing materials. ▪ Engage a licensed asbestos assessor to undertake air monitoring, clearance inspections and update the asbestos register following the removal of asbestos materials as per the NSW Work Health and Safety Regulation, 2017 and the SafeWork NSW Code of Practice How to Safely Remove Asbestos, 2022. ▪ Any works, which may disturb lead-based paint systems, to be conducted in accordance with the requirements of Australian Standard AS4361.2: 2017 Guide to Lead Paint Management; Part 2: Residential and Commercial Buildings. If any lead paint is removed during the process, it to be noted that lead paint waste is pre-classified by the NSW EPA as 'hazardous waste' with the exception from residential premises or educational or child care institutions. ▪ Remove identified SMF and PCB materials under controlled conditions if construction works are to impact or disturb these materials. ▪ Remove the redundant wastewater drainage pipework carefully under controlled conditions by a competent contractor with mercury remediation experience and dispose of as hazardous waste. ▪ Engage a hazardous materials consultant to conduct exposure (personal) and static mercury vapour air monitoring during the removal process and also a clearance inspection and clearance air monitoring following satisfactory completion of the remediation work and prior to re-occupation of the area. ▪ If materials suspected of containing asbestos or unknown materials are encountered, construction works must cease pending further sampling. <p><u>Flammable Liquids</u></p> <ul style="list-style-type: none"> ▪ Storage and handling in accordance with in AS 1940:2017 <i>The storage and handling of flammable and combustible liquids</i>, including storage within a compliant flammable liquid cabinet. <p><u>Corrosive Materials</u></p> <ul style="list-style-type: none"> ▪ Storage and handling in accordance with AS 3780:2008 <i>The storage and handling of corrosive substances</i>, including: <ul style="list-style-type: none"> – A supply of water shall be available at a nearby location; – Adequate ventilation to be provided; – Incompatible substances shall not be kept near corrosive materials; – Packages to be kept away from sources of heat; – Surfaces where materials are stored shall be resistant to corrosive nature of the materials; and 		

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						<ul style="list-style-type: none"> - Appropriate spillage retention shall be in place where packages are opened, or material transferred; and - containers to which the material will be transferred is confirmed suitable for corrosive materials. <p><u>Radioactive Materials</u></p> <ul style="list-style-type: none"> ▪ Storage and handling in accordance with AS/NZS 2243.4:2018 <i>Safety in laboratories, Part 4: Ionizing radiation</i>, including: <ul style="list-style-type: none"> - Storage of radioactive materials shall be in a dedicated radioactive source store, separate from other dangerous goods; - The store's interior surfaces shall be constructed of materials which can be decontaminated easily; - The store shall be adequately shielded to ensure that radiation levels outside the store do not exceed the relevant occupational and public dose rates. See Column 3 of Appendix B, Table B3 of AS/NZS 2243.4:2018 for occupational and public dose rates; - A radiation warning sign shall be erected at each entrance to the store, so that it is clearly visible to any person before they can gain access to the radioactive materials; - The store shall be provided with sufficient air exchange to ensure that the dose limits set out in Appendix A of this standard are not exceeded. Where an extraction system is required, it shall be in accordance with the requirements of AS 1668.2 for noxious discharges; and <p>All containers of radioactive materials (including waste) shall be labelled.</p>		
Contamination	Risk of site contamination	C	D	3	Low	<ul style="list-style-type: none"> ▪ At the time construction / demolition additional data gap testing is recommended to assess currently inaccessible areas. The results can also be used for waste classification purposes (if required) including: <ul style="list-style-type: none"> - Testing at the location of the proposed lift pit which is currently inaccessible; - If sections of the existing E25 slab are removed the exposed area to be inspection and opportunistic samples collected to confirm the contamination; - Additional testing within the proposed basement of the extension to better assess the potential asbestos risk at the Site; ▪ The presence of asbestos in fill (below the adopted SAC) at BH7 to be noted in the hazardous building materials register for Building E25; ▪ An unexpected finds protocol to be prepared for the proposed development to address potential contamination finds during waste classification assessment, demolition or excavation works; and ▪ Decommissioning of current on-site waste management infrastructure (e.g. the dilution pits, grease arrestor tank and associated trade waste pipelines) which is not to be used under the proposed development. This to include removal of the infrastructure, and any associated contamination impacted soil, and validation of the success of the removal. The requirements for the decommissioning to be identified prior to decommissioning and may be included in the unexpected finds protocol. It is recommended that key chemicals potentially disposed through the trade waste system listed in the manifest to be considered as part of the decommissioning process. ▪ A hazardous building material survey is required of the current buildings to assess the presence of hazardous building material prior to demolition / refurbishment and to inform management requirements; and <p>All waste to be disposed off-site must be assessed, managed and disposed in accordance with the POEO Act and associated regulations. Further testing and assessment is required to classify soils at the Site for off-site disposal.</p>	Ma	Low
Aviation	Impact of the development construction on flight paths	C	D	3	Low	<p>The development is required to be notified to Airservices Australia as a tall structure. The development, and any associated construction crane(s) will require formal assessment by both CASA and Airservices Australia, with approvals for airspace intrusion required from the Commonwealth Department of Infrastructure, Transport, Regional Development, Communication and the Arts.</p> <p>As any crane(s) for the construction of the development will be close to the POW Hospital HLS, the NSW Ministry of Health Guidelines for Hospital Helicopter Landing Sites in NSW require such cranes to be lit when "in the vicinity" of a hospital HLS. The illumination requirements for</p>	Ma	Low

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						<p>cranes in the vicinity of a hospital HLS are detailed below. It to be noted that there are no specified lighting requirements for mobile cranes, however a similar level of safety to be applied for these as would be applied for tower cranes.</p> <p><u>As a minimum for all tower [hammerhead] cranes:</u></p> <ul style="list-style-type: none"> top of crane A frame or cabin: medium intensity flashing red obstruction light; both ends of Jib: medium intensity flashing red obstruction light along Jib: line of white LED fluoro on a PE cell along the full length of the jib, and tower section: stairway lights or spot lights attached to the top of the tower pointing down and onto the tower (not up into pilot eyes). <p><u>As a minimum for all luffing cranes:</u></p> <ul style="list-style-type: none"> top of crane A-frame or cabin: medium intensity red obstruction light; end of Jib: medium intensity red obstruction light; along Jib: line of white LED fluoro on a PE cell along the full length of the jib; and tower section: stairway lights or spot lights attached to the top of the tower pointing down and onto the tower (not up into pilot eyes). <p>The LED jib fluoro lights are to be LED weather proof emergency fluoros controlled via a photoelectric cell with a minimum 90-minute battery back-up.</p>		
ESD	Non-compliance with the relevant sustainability policies and resultant impacts on the environment.					<p>The proposal will achieve ESD through a holistic approach to sustainable design, with a strong focus on energy efficiency, low carbon design strategies and reduced water consumption.</p> <ul style="list-style-type: none"> Façade configuration - glazing and building fabric thermal compliance Solar photovoltaic panels at roof level Energy metering and monitoring Water metering and monitoring Materials selection Indoor environment quality initiatives Biodiversity and landscaping optimisation Climate change adaptation measures. 		
Aboriginal Heritage	Impact of the development on any aboriginal archaeological deposits and objects.	C	C	3	Medium	<ul style="list-style-type: none"> As the proposed works are unlikely to cause harm to Aboriginal objects, it is recommended that no further investigation is required for the present development and that the proposed development can proceed in line with the Archaeological Unexpected Finds Procedure and Human Remains Procedure outlined below. <p><u>Unexpected Archaeological Finds Procedure</u> To any archaeological deposits be uncovered during any site works, the following steps must be followed:</p> <ul style="list-style-type: none"> All works within the vicinity of the find must immediately stop and the location cordoned off with signage installed to stop any accidental impact to the finds. The find must not be moved 'out of the way' without assessment. The site supervisor or another nominated site representative must contact either the project archaeologist (if relevant) or Heritage NSW (Enviroline 131 555) to contact a suitably qualified archaeologist. The nominated archaeologist must examine the find, provide a preliminary assessment of significance, record the item and decide on appropriate management measures. Such management may require further consultation with Heritage NSW, preparation of a research design and archaeological investigation/salvage methodology and registration of the find with the Aboriginal Heritage Information Management System. Depending on the significance of the find, reassessment of the archaeological potential of the subject area may be required and further archaeological investigation undertaken. Reporting may need to be prepared regarding the find and approved management strategies. Works in the vicinity of the find can only recommence upon receipt of approval from Heritage NSW. <p><u>Human Remains Procedure</u> In the unlikely event that human remains are uncovered during the proposed works, the following steps must be followed:</p> <ul style="list-style-type: none"> All works within the vicinity of the find must immediately stop and the location cordoned off with signage installed to stop any accidental impact to the finds. 	Ma	Low

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						<ul style="list-style-type: none"> The site supervisor or other nominated manager must notify the NSW Police and Heritage NSW (Enviroline 131 555). The find must be assessed by the NSW Police, which may include the assistance of a qualified forensic anthropologist. Management recommendations are to be formulated by the NSW Police, Heritage NSW and site representatives. Works are not to recommence until the find has been appropriately managed. 		
Ground and Water Conditions	Impacts of disturbance of soil profiles	C	C	3	Medium	<p>Design parameters for batter slopes, retaining walls and ground anchors based on site specific investigation/laboratory testing of ground conditions. Design parameters for batter slopes, retaining walls and ground anchors based on site specific investigation/laboratory testing of ground conditions. Geotechnical inspections of batter slopes and ground anchor installation</p> <p>Use rock saws prior to rock hammering, undertake vibration trials and possibly on-going vibration monitoring.</p> <p>Design parameters for footing design based on site-specific investigation/ laboratory testing of ground conditions. Geotechnical inspections of foundations.</p> <p>Design parameters for subgrade and pavements based on site specific investigation/laboratory testing of ground conditions. Subgrade preparation, earthworks inspection and testing. Installation of drainage.</p> <ul style="list-style-type: none"> Vibration trials to measure ground vibrations produced by plant and equipment during construction to check that the recommended vibration limits for structures or in-ground services are not exceeded, to reduce the risk of damage. On-going vibration monitoring to be adopted if vibration trials indicate a potential for exceedances, or may be undertaken as a precautionary measure. <p>Dilapidation surveys of the current conditions of adjacent structures are completed by a structural engineer such that records are available if damage occurs from construction works.</p> <ul style="list-style-type: none"> A Groundwater Monitoring Program (GMP) is proposed to be implemented during construction. The monitoring program will include groundwater level measurement in a monitoring well and water quality monitoring of any water seeping into the excavations (if any). To any groundwater inflow be observed during excavation, volumes will be recorded. To inflow rates be significant, construction will be halted and further assessment by Douglas Partners will be undertaken to advise on a management strategy, possibly including grouting of nearby rock defects to reduce groundwater inflows. In the unlikely event of groundwater inflows in the excavations during construction, water quality testing of the water contained in the excavations will be undertaken to ensure its suitability for disposal. To exceedances of the selected disposal criteria be found, treatment will be required prior to disposal. Stormwater is to be managed during construction to reduce the risk of water damage on adjacent below ground structures and keeps the subsoils relatively dry to reduce the risk of damage to pavements, slabs on ground and in-ground services. 	Ma	Low
Waste Management	Impact of waste to the environment	C, O	C	4	Low	<p>A detailed Construction and Demolition waste strategy will be incorporated into the site's Construction Management Plan (or equivalent), to be prepared as a separate document by the principal construction contractor prior to the commencement of construction works.</p>	Ma	Low
Social Impact	Social impact of the development	C, O	B	3	Medium	<ul style="list-style-type: none"> Activating the proposal through engaging students and facilities in programs, events, workshops, and collaborative projects to enhance the value of the proposal. Designing and furnishing the development with flexible and adaptive furniture could also enhance the use of these spaces. Implement wayfinding around the building to inform users of nearby public and active transport networks, as well as other buildings and landmarks on the campus and within the RHIP. 	Ma	Very Low

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						<ul style="list-style-type: none"> A program of events and activities that extend beyond the university cohorts to engage practitioners in the RHIP and beyond, thereby fostering greater impact and reach for research and innovation in biomedical sciences. <p>The CPTED Report identifies a number of measures to increase safety and reduce crime risk. These include access control measures, including secure entry points and clear wayfinding, to ensure that only authorised individuals can access sensitive areas. In addition, space management practices, such as regular maintenance and cleanliness, will contribute to a safe and welcoming environment</p>		